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Abstract: Since 2013, March 20 has been recognized as World Happiness Day by the United Nations, emphasizing the significance of well-being beyond purely economic considerations. While traditional economic and social indicators provide valuable insights, a comprehensive approach to measuring happiness requires a broader set of socioeconomic variables. However, many existing studies overlook endogeneity issues in panel data analysis. This study addresses this gap by employing a Panel Vector Autoregressive model, which treats all variables as endogenous, allowing for the identification of bidirectional relationships, path dependencies, and potential virtuous circles. Economic factors remain central to well-being, with numerous studies confirming a positive correlation between happiness and GDP per capita. Furthermore, governance quality plays a crucial role, encompassing democratic participation, freedom of expression, government effectiveness, the rule of law, and corruption control, all of which contribute to overall life satisfaction. Beyond economic and governance aspects, environmental sustainability has emerged as a critical determinant of happiness, particularly in developed nations. Climate change and environmental degradation have severe socioeconomic consequences that negatively impact well-being. Additionally, cultural factors such as gender equality, could significantly influence happiness by fostering economic growth and social stability. This study conducts an empirical analysis using panel data from 27 EU countries spanning the years 2011 to 2023, offering new insights into the determinants of well-being and their policy implications. The analysis reveals that both well-being and GDP are path-dependent, with rising GDP contributing to greater happiness. Institutional quality enhances both life satisfaction and economic development, while lower CO₂ emissions similarly exert a positive effect on both outcomes. Institutional quality and environmental factors are closely interlinked: improved governance helps reduce emissions, while increasing emissions can prompt institutional responses. An enhancement in overall life satisfaction—frequently associated with increased job fulfilment and higher productivity—tends to exert a positive influence on average per capita income. Higher gender inequality diminishes happiness. Gender equality is also associated with lower emissions, suggesting that greater female participation supports sustainable development. However, some findings are unexpected: GDP growth does not necessarily lead to reduced emissions or improved institutional quality, and stronger institutions do not directly alleviate gender inequality. These complexities highlight the

need for further research that accounts for contextual factors, time lags, and sample heterogeneity.

Keywords: *Well-being; Gross Domestic Product; institutional quality; CO₂ emissions; gender inequality.*

JEL Classification: *I30; E71; O1.*

1. Introduction

Since 2013, March 20 has been celebrated as World Happiness Day, established by the UN (United Nations). The aim is to highlight the importance of well-being in individuals' lives, beyond the always-important economic aspects. In addition to the well-known economic and social indicators, there are several other indicators that policymakers can use to measure happiness and guide them in developing social policies. Research on happiness, however, should not rely on a single aggregate indicator, but rather on a set of socioeconomic indicators related to different aspects of life that, when improved, could positively affect well-being.

Although several studies have addressed this topic, many have overlooked the issue of endogeneity in panel data (Paleologou, 2022). This paper aims to fill that gap. To achieve this, the Panel Vector Autoregressive (PVAR) model has been employed, as it treats all variables as endogenous and can identify potential bidirectional relationships (including possible virtuous circles) as well as path dependencies (Marra et al., 2024a; Wang et al., 2022).

Among the primary factors influencing well-being are economic variables. Numerous studies have examined the relationship between happiness and GDP per capita, consistently finding a positive correlation (Tauseef, 2022). Empirical studies provide substantial evidence indicating a significant positive correlation between individuals' overall life satisfaction and their level of job satisfaction, with implications for labour productivity (Weziak-Białowolska et al., 2020). However, it is important to note that an increase in per capita income does not always lead to a proportional rise in well-being (Easterlin, 1974; Clark et al., 2016). In country-level analyses, this discrepancy may stem from the failure to account for the distribution of wealth within the population.

Numerous empirical studies have established a significant correlation between happiness and various aspects of governance. These include the opportunity for citizens to participate in the selection of their government, as well as the freedoms of expression and association and the presence of an independent and free media; the absence of violence and terrorism, which ensures a stable and secure environment; government effectiveness, referring to the ability to deliver public services efficiently and implement policies effectively; the rule of law and public trust, characterized by confidence in the legal and societal framework, along with lower crime and violence rates; and the absence of corruption, which can lead to inefficiencies and ultimately hinder economic growth. Empirical analyses frequently reveal that countries with high-quality institutions tend to have happier and more satisfied citizens (Youssef and Diab, 2021).

Environmental preservation has increasingly been recognized as a fundamental determinant of societal progress, particularly in the context of developed nations. Given this, it is essential to examine the extent to which well-being is influenced by a healthy environment. The acceleration of climate change, driven by polluting emissions, has led to rising global temperatures and more frequent extreme weather events. These environmental shifts have far-reaching socioeconomic consequences, which are likely to negatively impact overall happiness and life satisfaction (Apergis and Majeed, 2021). Empirical evidence underscores the significant role that environmental factors play in shaping well-being across different countries.

Happiness can be influenced by cultural factors, including gender equality, which is a key objective of the United Nations' Sustainable Development Goals. Notably, gender equality and the protection of women's rights are not only fundamental human rights but also essential prerequisites for achieving broader socioeconomic objectives. Research has highlighted that fostering gender equality contributes to economic growth, environmental sustainability, and overall societal well-being (Colantonio et al., 2022).

The next section presents the empirical analysis conducted on panel data from 27 EU countries spanning the period from 2011 to 2023, revealing noteworthy findings into the socioeconomic determinants of well-being. The final section discusses the conclusions, policy implications, and limitations of the study.

2. Empirical analysis

2.1. Method

The aim of this analysis is to highlight the role that key social factors play in determining well-being and the possible virtuous circles surrounding it, using the longest possible time span (2011–2023) for a panel of 27 EU countries.

We utilize a Panel Vector Autoregressive (PVAR) model, structured around a system of equations in which all variables are considered endogenous. This approach facilitates the examination of complex interrelationships between variables. Additionally, the PVAR model enables the analysis of the impact of an exogenous shock to one variable on another within the system, while holding all other variables constant. This feature allows for the identification of bidirectional dynamic effects and the potential presence of path dependence.

In line with recent literature, we propose a PVAR model based on the variables listed in Table 1.

Table 1: Variables description and sources

Variable	Definition	Source
WB	Happiness score (Life Ladder)	World Happiness Report
GDP	GDP per capita, PPP (constant 2021 international \$)	World Bank
WGI	Aggregate indicators of six dimensions of governance	World Bank

Variable	Definition	Source
CO2	Carbon dioxide (CO2) emissions excluding LULUCF per capita (t CO2e/capita)	World Bank
GII	Gender Inequality Index	UNDP

The measurement of well-being in this analysis is derived from the Gallup World Poll and it is represented by the national average response to a standardized life evaluation question. The question, posed in English, is as follows: "Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you, while the bottom represents the worst possible life. On which step of the ladder would you place yourself at this moment?". This metric, commonly known as the Cantril Life Ladder or simply the Life Ladder, serves as a key indicator in our analysis of life satisfaction or happiness across different populations (Behera et al., 2024).

The analysis would be incomplete without a measure of economic well-being. In this regard, we have chosen to include GDP per capita (adjusted for purchasing power parity), a commonly used indicator in similar studies (Chen and Hsu, 2024). An increase in GDP is expected to correspond with a rise in average life satisfaction, although some cross-country studies highlight the existence of the so-called Easterlin Paradox (Easterlin, 1974), which suggests that happiness is unlikely to increase with economic growth over time (Bartolini and Sarracino, 2014).

To measure institutional quality, we follow Amare et al. (2025) and refer to the World Governance Indicator (WGI) introduced by the World Bank. These composite variable aggregates six key dimensions: "Control of Corruption, Government Effectiveness, Political Stability and Absence of Violence, Regulatory Quality, Rule of Law, and Voice and Accountability" (for further details, see Kaufmann and Kraay, 2024).

Living in a healthy environment is widely recognized as a key contributor to well-being. Therefore, this analysis considers carbon dioxide emissions (CO₂), as their increase is expected to raise public awareness of environmental issues (Marra and Colantonio, 2021) and lead to a decline in life satisfaction (Ko et al., 2024).

Finally, we employ the Gender Inequality Index (GII) developed by the United Nations Development Program. It captures gender-based disparities across three key dimensions: reproductive health, empowerment, and labour market participation. It quantifies the extent of inequality between men and women by measuring the loss in potential well-being caused by these disparities (Audette et al., 2019).

The standard PVAR model is defined by the following system of equations, as outlined by Love and Zicchino (2006):

$$X_{it} = f_i + g_t + \Gamma(L)X_{it} + \varepsilon_{it} \quad (1)$$

In this framework, X_{it} represents the vector of stationary variables used in the analysis, f_i captures country-specific fixed effects, g_t accounts for year-specific fixed effects, $\Gamma(L)X_{it}$ denotes a square matrix of polynomials in the lag operator, and ε_{it} represents the stochastic error term (subsequently, d is introduced to signify the first-difference operator).

Table 2 presents the key descriptive statistics.

Table 2: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
WB	297	6.414	0.754	3.889	7.856
GDP	351	49729.150	21827.660	22293.410	135379.300
WGI	351	0.995	0.483	0.064	1.867
CO2	351	6.917	3.017	2.998	21.395
GII	324	0.986	0.019	0.948	1.033

2.2. Tests

Implementing the PVAR model necessitates the use of stationary variables, as non-stationarity may lead to spurious results. Therefore, the initial step of the analysis involves assessing the stationarity of the variables using first- and second-generation unit root tests. Specifically, two first-generation tests—the Im, Pesaran, and Shin (IPS) test and the Maddala and Wu (MW) test—along with the second-generation Pesaran test, were conducted. Each of these tests operates under the null hypothesis that the series contains a unit root. The findings presented in Table 3 indicate that the variables usually exhibit non-stationarity in level.

Table 3: Stationarity tests at level

Variable	IPS W-t-bar	MW	Pesaran
WB	-2.408***	102.906***	-1.183
GDP	4.715	13.483	2.470
WGI	1.547	37.461	2.382
CO2	1.750	69.284*	-1.047
GII	-1.586*	205.201***	-2.471***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

In such cases, an appropriate approach is to apply the first-difference transformation (Gyimah et al., 2022). The unit root tests were also conducted on the transformed variables. Based on the results presented in Table 4, it can be concluded that all series are integrated of order one (I(1)), indicating that the selected variables become stationary after applying the first-difference transformation.

Table 4: Stationarity tests: first differences

Variable	IPS W-t-bar	MW	Pesaran
dWB	-2.099**	58.594	-2.422***
dGDP	-11.271***	211.483***	0.998
dWGI	-10.812***	114.253***	-2.720***
dCO2	-11.633***	170.581***	-3.300***
dGII	-11.683***	231.955***	-2.626***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

To account for potential cross-sectional interdependencies, four cointegration tests proposed by Westerlund (2007) were conducted. These tests are based on the null

hypothesis of no cointegration, which, as indicated by the results in Table 5, cannot be rejected. Consequently, the selection of first-difference estimates is justified, given that the variables in their level form are both non-stationary and non-cointegrated.

Table 5: Cointegration analysis results

Statistic	Value	p-value
G_{τ}	-1.191	0.660
G_{α}	-1.555	0.500
P_{τ}	-2.767	0.760
P_{α}	-1.252	0.510

Note: p-value are robust critical values obtained through bootstrapping with 100 replications

To evaluate the potential impact of collinearity and multicollinearity on our analysis, we examined the correlation matrix and calculated the variance inflation factor (VIF). The results, presented in Table 6—where dWB is used as the dependent variable—indicate low correlation values and consistently low mean VIF and individual VIF scores. Therefore, we conclude that collinearity and multicollinearity do not pose a significant concern in this study.

Table 6: Correlation matrix and variance inflation factors

	dWB	dGDP	dWGI	dCO2	dGII
dWB	1.000				
dGDP	0.111	1.000			
dWGI	0.108	0.058	1.000		
dCO2	0.067	0.298	0.012	1.000	
dGII	0.077	0.045	0.025	0.017	1.000
VIF		1.100	1.000	1.100	1.000
mean VIF	1.050				

The final preliminary step in our analysis involves determining the optimal lag length. Econometric literature suggests that commonly used selection criteria include the Moment Akaike Information Criterion (MAIC), the Moment Bayesian Information Criterion (MBIC), and the Moment Hannan-Quinn Information Criterion (MHQIC), all of which are based on maximum likelihood estimation. Following the methodology of Andrews and Lu (2001), the optimal lag length is identified by minimizing the moment model selection criteria—MBIC, MAIC, and MHQIC. Based on the results presented in Table 7, the most appropriate specification for our model is a first-order PVAR.

Table 7: Lag order selection criteria

Lag	MBIC	MAIC	MHQIC
1	-408.891	-100.132	-225.493
2	-309.165	-77.595	-171.616

The use of the first difference transformation allowed to remove the country-specific fixed effects (f_i) in Equation (1). This procedure, however, may introduce so-called Nickell bias (1981) due to the correlation between the first-differenced lag and the first-differenced error term, both of which depend on ε_{it-1} . In this scenario, estimating the model using Ordinary Least Squares (OLS) would lead to biased and inconsistent results (Baltagi, 2008). To address this issue, we employed forward mean-differencing, also known as the Helmert transformation (Ht) (Arellano and Bover, 1995; Love and Zicchino, 2006) to overcome this problem. Notably, applying the Ht to the raw data yields the same outcome as applying Ht to demeaned data, ensuring the removal of year fixed effects g_t in Equation (1). Consequently, the model can be estimated using the Generalized Method of Moments (GMM), with lagged values of the regressors serving as instruments.

2.3. Results and discussion

The first order PVAR results are shown in Table 8.

Table 8: Estimation results of the PVAR model

		Dependent variables				
		dWB	dGDP	dWGI	dCO2	dGII
Lagged independent variables	dWB	0.936***	14.528***	-0.158***	0.611***	0.011***
	dGDP	0.000***	0.704***	-0.000***	-0.000	-0.000**
	dWGI	0.513***	16.725***	-0.475***	-1.040**	0.023***
	dCO2	-0.099***	-5.356***	0.158***	-0.075	-0.002***
	dGII	-13.510***	56.849	1898.000	14.370**	-0.145***

Note: *p < 0.1; **p < 0.05; ***p < 0.01

Focusing on the first column, we can highlight that the variable related to life satisfaction exhibits path dependence. Notably, an increase in GDP leads to greater well-being, aligning with much of the existing literature (Agrawal et al., 2023). Therefore, the Easterlin paradox is not observed in this analysis. Furthermore, an improvement in institutional quality, represented by positive variations in the WGI composite index, has a positive impact on happiness, consistent with previous research on the subject (Li and An, 2020). A rise in life satisfaction, as measured by the Ladder index, is also recorded following a reduction in CO₂ emissions—an indicator of both a healthier ecosystem and public awareness of environmental issues (Ko et al., 2024). Finally, an increase (i.e., a worsening) in the Gender Inequality Index appears to have a negative effect on the population's average happiness. However, GII, which has not shown path dependence over time, summarizes a relatively new cultural topic that deserves further analysis.

The analysis of the second column reveals interesting virtuous circles, with GDP as the dependent variable exhibiting path dependence. An increase in happiness, often accompanied by greater job satisfaction and higher labour productivity, appears to have a positive effect on average per capita wealth, aligning with recent studies (Nazneen and Sgroi, 2023). As expected, an improvement in institutional quality positively influences economic growth. Enhancing corruption control, governmental efficacy,

political stability and the absence of violence, regulatory quality, adherence to the rule of law, and civic participation inevitably yields positive economic and financial repercussions (Fengju and Wubishet, 2024; Basnayake et al., 2025). A reduction in CO₂ emissions, moreover, has a positive impact on GDP. Presumably, the transition to cleaner and more energy-efficient technologies is beginning to yield benefits in both environmental and economic terms (Marra et al., 2024b). Finally, the GII does not exhibit any significant effects on GDP.

From the analysis of the remaining columns, other interesting, expected relationships emerge. An increase in CO₂ appears to contribute to an improvement in institutional quality, as environmental issues in recent years have increasingly prompted institutions to respond with appropriate policies (Marra and Colantonio, 2023). The inverse relationship is also expected: an improvement in the governance index WGI leads to a reduction in polluting emissions. Additionally, a variation in the GII is accompanied by a variation of the same sign in CO₂. Specifically, a reduction in the gender gap and greater involvement of women, particularly in the workplace, seem to promote progress toward sustainable development (Colantonio et al., 2022). Finally, an increase in GDP per capita may help reduce gender inequality.

Some relationships, however, do not exhibit the expected sign. Specifically, an increase in per capita wealth is not associated with a reduction in polluting emissions. A possible explanation for this phenomenon lies in the rise in energy demand that accompanies greater wealth. Historically, this demand has been met primarily through fossil fuels, contributing to environmental degradation (Marra and Colantonio, 2022). Similarly, an increase in GDP does not have a positive impact on institutional quality, which, in turn, does not demonstrate path dependence. Lastly, an improvement in institutional quality does not appear to have a positive effect on reducing gender inequality. Again, potential explanations for these counterintuitive findings may stem from the heterogeneity of the sample, variations in the time lag associated with the manifestation of effects, and other contextual factors.

The stability of the PVAR model was assessed, revealing that the eigenvalues are all strictly less than 1 (Lutkepohl, 2005), as highlighted in Table 9. This stability ensures that the PVAR model is invertible, thereby enabling bidirectional interpretations, as well as the estimation of impulse-response functions and the analysis of variance decomposition (Abrigo and Love, 2016). Furthermore, the over-identification restriction test (Hansen's J chi-squared) yielded a value of 106,962 (p-value = 0,299), which supports the model's goodness-of-fit. This result confirms that the null hypothesis—that the over-identification restrictions are valid—holds true. In other words, the included instrumental variables are both valid and uncorrelated with the error term, while the excluded instruments are correctly omitted.

Table 9: Eigenvalue stability condition

Real	Imaginary	Modulus
0.966	0.000	0.966
0.157	-0.497	0.521
0.157	0.497	0.521
-0.167	-0.261	0.310

Real	Imaginary	Modulus
-0.167	0.261	0.310

Moreover, the Granger causality tests, which examine the null hypothesis of no causality, indicate bidirectional causality and confirm the existence of endogeneity (see Table 10).

Table 10: Granger causality test

Equation Variable	Excluded Variables	Chi2	p-value
dWB	dGDP	10.533	0.001
	dWGI	9.951	0.002
	dCO2	48.496	0.000
	dGII	23.570	0.000
	ALL	78.298	0.000
dGDP	dWB	31.368	0.000
	dWGI	13.061	0.000
	dCO2	49.852	0.000
	dGII	0.943	0.332
	ALL	93.807	0.000
dWGI	dWB	8.090	0.004
	dGDP	39.494	0.000
	dCO2	61.335	0.000
	dGII	1.616	0.204
	ALL	67.179	0.000
dCO2	dWB	15.110	0.000
	dGDP	0.226	0.634
	dWGI	6.229	0.013
	dGII	4.691	0.030
	ALL	28.520	0.000
dGII	dWB	23.269	0.000
	dGDP	5.012	0.025
	dWGI	21.142	0.000
	dCO2	16.059	0.000
	ALL	88.820	0.000

Table 11 presents the variance decomposition, derived through the Cholesky decomposition method using 1,000 Monte Carlo simulations over 10 periods. This analysis measures the proportion of a variable's variation explained by shocks to another variable across time. The main findings indicate that each variable is primarily influenced by its own lag. Notably, a shock to happiness, often accompanied by higher job satisfaction and increased labour productivity, appears to have a significant effect on average per capita wealth.

Table 11: Variance decomposition analysis

		Impulse Variable				
Response variable	dWB	dWB	dGDP	dWGI	dCO2	dGII
	dGDP	81.174%	0.856%	1.721%	9.027%	7.222%
	dWGI	43.104%	30.811%	2.459%	20.593%	3.034%
	dCO2	30.999%	16.732%	21.018%	29.642%	1.609%
	dGII	8.803%	6.439%	4.448%	78.713%	1.596%
		4.820%	21.029%	6.422%	16.425%	51.303%

Note: Variation in response variable explained by the impulse variables in the columns (10 periods ahead)

Each impulse response function presented in Figure 1 illustrates the reaction of one variable to a one standard deviation shock applied to another variable, while holding all other shocks constant at zero. The impulse response functions were estimated using a Gaussian approximation based on 200 Monte Carlo simulations, employing the Cholesky decomposition method. Upon the application of a shock to a variable in the current period, the response variable typically exhibits a notable reaction in the initial years, followed by a slight fluctuation in subsequent periods.

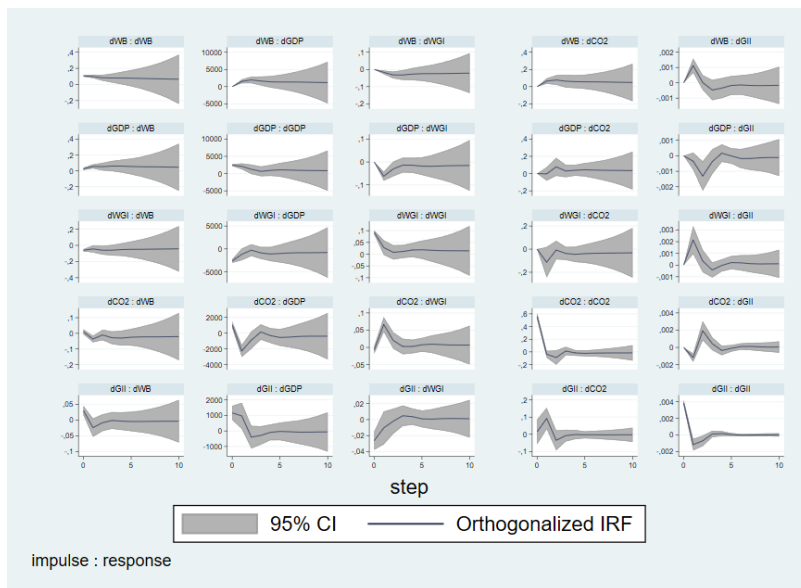


Figure 1: Impulse Response Analysis
3. Conclusions

The paper has explored the interdependencies among well-being, economic growth, institutional quality, environmental factors and gender inequality, using panel data from 27 EU countries from 2011 to 2023.

The analysis highlighted the path dependence of life satisfaction and GDP, with an increase in GDP positively influencing well-being, contrary to the Easterlin paradox. Policymakers could therefore prioritize economic growth as a means to improve overall life satisfaction, recognizing that increases in GDP may lead to better outcomes in terms of people's well-being. Policies might focus on sectors that contribute to economic growth, such as technology, infrastructure, education, and healthcare, which in turn would contribute to a higher quality of life. If certain market failures or inefficiencies are inhibiting the relationship between GDP and well-being, policymakers could intervene through targeted reforms, like addressing unemployment, ensuring fair wages, or improving access to essential services.

Institutional quality improvements, measured by the WGI index, enhance both well-being and economic growth. Policymakers should focus on improving the quality of institutions, such as enhancing rule of law, reducing corruption, and increasing government transparency. Stronger institutions can create a stable environment conducive to both economic growth and higher levels of well-being. Strengthening legal systems and regulatory frameworks can increase trust in public institutions and create more favorable conditions for businesses, leading to economic growth. This, in turn, can contribute to higher life satisfaction by fostering fairer, more predictable environments for individuals and organizations.

Additionally, reducing CO₂ emissions contributes to higher life satisfaction and GDP, likely due to the transition to cleaner and more efficient technologies. Policymakers could prioritize the development of green industries and technologies that reduce CO₂ emissions while driving economic growth. This could include investing in renewable energy (solar, wind, etc.), energy efficiency, and sustainable manufacturing processes. Green economic growth can lead to new jobs, innovation, and higher living standards, contributing to both GDP and well-being.

An enhancement in happiness, frequently correlated with higher job satisfaction and increased labour productivity, seems to exert a positive influence on the average per capita wealth. Policymakers should encourage the development of policies that improve job satisfaction, such as fair wages, better work-life balance, and positive workplace environments. By fostering higher job satisfaction, individuals' happiness could increase, which may, in turn, have a positive impact on economic outcomes. Policies aimed at enhancing job satisfaction can increase employee motivation and productivity. Governments could introduce initiatives that support employee engagement programs, skill development, and career growth opportunities, which would not only increase happiness but also contribute to higher productivity and economic performance.

Further findings reveal that institutional quality and environmental factors are interconnected: governance improvements reduce CO₂ emissions, while increasing emissions prompt institutional responses. Policymakers should focus on improving the quality of governance, including strengthening institutions that regulate and monitor environmental standards. Good governance—through transparent, accountable, and efficient institutions—can foster policies that effectively reduce CO₂ emissions. Investing in institutions that manage natural resources, environmental laws, and climate change mitigation efforts could lead to stronger environmental outcomes. The interconnectedness of governance and environmental factors calls for coordinated efforts between different sectors of government, such as economy, environment, health,

and infrastructure. Integrated policymaking can help address the root causes of emissions while ensuring that policies align with broader economic and social objectives.

A worsening Gender Inequality Index (GII) appears to negatively impact happiness. Notably, gender equality advancements correlate with lower emissions, suggesting that female participation fosters sustainable development. Policymakers could prioritize gender equality within environmental and sustainability policies. Recognizing that female participation can contribute to lower emissions, governments could ensure that women have equal access to decision-making roles in environmental policy development and implementation. Policies could focus on increasing female representation in sectors related to sustainability, such as renewable energy, sustainable agriculture, and green technology. Gender-inclusive policies could help drive more sustainable practices.

However, certain relationships deviate from expectations. GII does not significantly affect GDP. Higher GDP does not necessarily reduce emissions or improve institutional quality, likely due to increased energy demand and complex governance dynamics. Similarly, better institutions do not directly mitigate gender inequality. These counterintuitive results highlight the need for further research to account for contextual factors, time lags, and sample heterogeneity in assessing these complex relationships. The current model may not fully capture the complexity of the factors influencing the outcomes under investigation, as it primarily focuses on a limited set of variables, excluding others such as informal institutions, human capital, and social capital. Furthermore, alternative econometric models could be tested, or the analysis could be conducted on different groups of countries to assess the robustness of the results.

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DOES ICT SPUR POVERTY REDUCTION IN SOUTH AFRICA: AN EMPIRICAL INVESTIGATION

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Abstract: *This study examines the asymmetric impact of ICT on poverty reduction in South Africa using the NARDL approach. The study was motivated by the simultaneous existence of high poverty levels alongside increased government support for ICT adoption as a means to leverage economic development. The main objective of this study is to examine whether ICT can be a panacea for poverty alleviation in South Africa. Using annual time-series data from 1983 to 2021, the study found that positive changes in ICT are associated with poverty reduction in both the short and long run. However, negative changes in ICT were found to have no significant impact on poverty reduction. The results were corroborated by the dynamic multiplier graph, which showed that positive ICT shocks have a stronger and more sustained impact on poverty reduction compared to negative shocks.*

Keywords: *poverty reduction; information; communication and technology (ICT), South Africa; non-linear autoregressive distributed lag (NARDL)*

JEL Classification: *I32; I38; O330*

1. Introduction

The Sustainable Development Goals (SDGs) programme and its predecessor, the Millennium Development Goals (MDGs), both spearheaded by the United Nations (UN), drive economic development in most developed and developing countries. Among the goals pursued under each of the programmes, poverty has remained on the agenda, showing a persistent challenge. South Africa is not an exception to high poverty levels among other development challenges. The National Development Plan 2030 – an economic development blueprint for South Africa - acknowledges poverty among the triple challenges. At a global level, the target of poverty alleviation was met under the MDGs; however, at a national level, the achievement was highly uneven, with some countries continuously struggling with high poverty levels (UN, 2015a). The outbreak of the COVID-19 pandemic worsened poverty levels and reversed the achievements made, threatening the achievement of the targets set under the SDGs (UN, 2025b). Under the SDGs, poverty is captured under Goal 1 - No Poverty (end poverty in all its forms everywhere). The current projections indicate that 8.9% of the global population will still be living in extreme poverty by 2030 (UN, 2025c). The contributing factors identified by the UN include unemployment, vulnerability to national disasters and social exclusion. The SDGs also support advancement in ICT, expressed in Goal 9. Although South Africa still registers high poverty levels, commendable progress has been made

in advancing ICT across all sectors of the economy. The main objective of this study, therefore, is to examine whether South Africa can harness ICT advancements to alleviate poverty and achieve the SDGs' targets.

The extant literature that covers the impact of ICT on poverty reduction largely assumes a linear relationship between the two. Given that positive and negative changes in ICT may not have the same impact on poverty reduction, this study closes the existing gap by employing an asymmetric approach to examine the nature of the relationship. The results from the study will provide policy insights that can contribute to effective policies on poverty in South Africa. Further, current studies provide mixed results, making generalization of the results inappropriate. Some studies found ICT to reduce poverty (see, for example, Zhang et al., 2024; Kakeu, Wendji, & Kouhomou, 2024; Mateko, 2024; Garcia-Mora & Mora-Rivera, 2023), some studies found ICT to worsen poverty (see (Bergantino, Mario, & Nademi, 2025; Dzator et al., 2023)). Thus, the mixed results point to the importance of another study that focuses on South Africa.

South Africa has been trying to redress the imbalances of the past for over three decades after the end of apartheid, but poverty, unemployment, and inequality have remained its major challenges. These triple challenges are acknowledged in the National Development Plan 2030 as the 'triple challenge'. The outbreak of COVID-19 derailed the progress that was made generally on SDGs and particularly on poverty reduction in South Africa. The high poverty levels persist alongside notable ICT development across most sectors of the economy. The findings from this study offer new insights into effective policies that can be implemented, taking advantage of ICT development in the country. Moreover, most African countries view South Africa as a development model; findings from this study provide policy guidance not only to South Africa but also to other countries that view South Africa as a role model.

The study is divided as follows: Section 2 dwells on country-specific and empirical literature, Section 3 covers the methodology, and Section 4 outlines data analysis and discussion of results. Section 5 concludes the study.

2. Literature Review

2.1 ICT and Poverty Reduction Dynamics in South Africa

South Africa's ICT infrastructure was limited prior to 1994, monopolized by the South African Post Office and Telkom South Africa. The period was characterized by low internet penetration and technology. The Telecommunication Act of 1996 provided a framework for ICT development in South Africa. There was a gradual uptake of ICT in South Africa, with new players entering the market, such as Vodacom and MTN, as internet Service providers. The South African government realized the importance of ICT in advancing the country's economic objectives. The National Development Plan identifies ICT as a crucial component in driving socio-economic transformation in South Africa (Telecommunication and Postal Services, 2016). The National Integrated ICT Policy White Paper of 2016 covers government's approach to stakeholder participation on the drive to digital transformation; addresses issues of ICT and convergence; policies to protect open internet; mechanism to promote growth in ICT and postal industries; interventions to facilitate digital transformation of society, among other goals (Telecommunication and Postal Services, 2016).

The Independent Communication Authority of South Africa Act of 2000 established the Independent Communication Authority of South Africa (ICASA). The ICASA is responsible for regulating and licensing in the telecommunication, broadcasting, and postal industries (ICASA, 2025). The ICASA is further responsible for monitoring and compliance of broadcasting and electronic communication services, and protection of consumers and telecommunication numbering (ICASA, 2025). On postal services, ICASA has a license to monitor the South African Post Office on customer care and universal service obligation (ICASA, 2025).

South Africa has made strides in deepening ICT access, usage and closing the digital divide. The government partners with the private sector to reach underserved areas in the country. The government has established a solid framework for ICT advanced through some legislation, like the Telecommunications Act of 2000, the Electronic Communications Act of 2014, and the Promotion of Access to Information Act of 2000 (Department of Telecommunications and Postal Services, 2016).

On the poverty front, poverty alleviation has remained among the goals the UN advanced under the MDGs and the successor programme – SDGs, which indicates that poverty is not a problem for South Africa alone, but a global challenge. South Africa is a signatory to the SDGs, showing the country's commitment to poverty eradication, among other SDGs. The country's economic blueprint – the National Development Plan 2030 acknowledges poverty to be among the triple challenge.

The NDP is a strategic document that provides a framework for the implementation of the SDGs with a South African flavor. The government acknowledges inequality and unemployment to be among the challenges that the country is facing and calls for all stakeholders to join hands in the fight against poverty, inequality, and unemployment. Persistent inequality and unemployment have hindered progress in poverty alleviation, as these issues are closely interconnected.

South Africa's approach to poverty entails immediate relief to the poor through an expansive social safety net, provision of services like education and health and integration of the poor into the economic mainstream through economic empowerment programmes. South Africa has arguably a large social safety net that covers a broad range of the less privileged (World Bank, 2021). There are several grants that target different vulnerable categories in society. Some of the grants include child support, care dependency, foster care, disability, old persons, War Veterans, social COVID-19 relief of Distress and grant-in-aid (World Bank, 2021). Apart from a comprehensive social safety net, South Africa provides social services as a means of breaking a vicious cycle of poverty. There are selected schools and health services that are offered for free. The Free Basic Services expanded on free service availed to indigents, such as water, electricity, sanitation and sewerage (Statistics South Africa's StatsSA, 2025).

The third approach to poverty alleviation entails an integration of the poor into the economic mainstream through support programmes targeting the previously disadvantaged population. The programmes advanced include the Expanded Public Works Programme (EPWP), which provides temporary employment to the poor and vulnerable (Department of Public Works and Infrastructure, 2025). The programme also provides a platform for the poor and vulnerable to gain experience that is valuable in getting into formal employment. The government also took initiatives to support Small, Micro, and Medium Enterprises (SMMEs). Initiatives include availing of channels for accessing low-interest loans, business incubators and regulatory reform, which is

simplifying the registration and starting of a new business. Black Economic Empowerment (BEE) and the more encompassing Broad-Based Black Economic Empowerment (BBBEE) are initiatives taken by the government as a strategic framework to implement transformation changes in South Africa, seeking to empower previously disadvantaged individuals in South Africa (Skills Development Facilitation Corporation, 2025). The government also partners with non-governmental organizations and the private sector to support the youth. For example, the Harambee Youth Employment Accelerator works to find solutions to the youth unemployment challenge (Harambee, 2025). In South Africa, most households get income from employment, implying that unemployment positively contributes to poverty. This is implemented in conjunction with the Youth Employment Services (YES), an initiative by the government. Figure 1 reports the trends in poverty and ICT captured by fixed telephone lines in South Africa from 2000 to 2022.

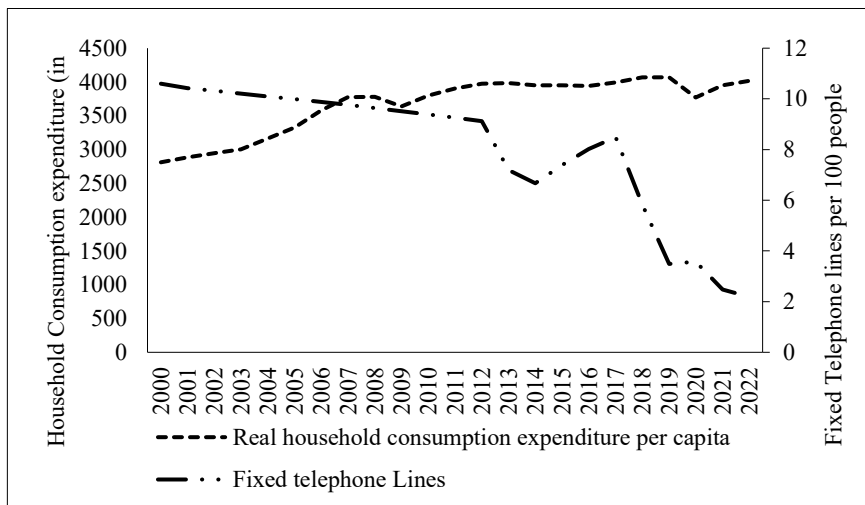


Figure 1: Trends in Household consumption expenditure per capita and fixed telephone lines 2000-2022

Source: World Bank (2025)

As indicated in Figure 1, there was a short-lived decline in fixed telephone lines that was reported between 2000 and 2014, which was followed by a surge in 2015. This gradual and short-lived decline in fixed telephone lines could be attributed to the growth in the use of mobile phones. Conversely, real household consumption expenditure steadily increased during the study period, suggesting a steady decline in poverty.

2.2 Empirical Literature Review

Poverty measures are broad, and they go beyond income and expenditure metrics to cover multidimensional aspects. According to Amartya Sen's Capability Approach (CA), poverty goes beyond the traditional measures that are biased towards income and expenditure power to emphasize individual freedom and the ability to achieve a life they

value. Capabilities relate to the freedom that individuals must achieve functions. The theory emphasizes capabilities, well-being, functioning, equality and freedom. The Capability Approach emphasizes the multidimensional measure of poverty as important in understanding poverty. Under the classical growth theory, ICT, like any other factor of production, is subject to diminishing returns. The neoclassical growth models extended the classical economic schools of thought by incorporating the role of technology as a driver of long-term growth. The theory links poverty reduction to the economic growth channel. When nations advance growth through enhancing factors of production, this is normally associated with high living standards and employment. These two factors result in poverty reduction. However, this channel works assuming equal distribution of income. In the case of South Africa, where income inequality is high, an increase in GDP may not result in poverty alleviation as limited growth filters down to the poor. Studies that found ICT to reduce poverty and those that found ICT to worsen poverty reduction are reviewed.

Zhang et al. (2024) examined the impact of the National Rural E-commerce Comprehensive Demonstration Project (NRECDP) on poverty reduction and income growth. Employing the diffidence-in-difference model using panel data from 2010 to 2020, the study found NRECDP to increase the disposable income of rural residents with a huge impact on the national level poverty-stricken counties. Kakeu, Wendji and Kouhomou (2024) studied the impact of ICT on poverty for 36 sub-Saharan African countries from 2008 to 2019. Using panel data analysis and a multidimensional poverty measure, the study found that technological innovation can reduce poverty. In the same spirit, Mateko (2024) analyzed the impact of ICT on poverty in Nigeria using data from 1992 to 2020. Using autoregressive distributed lag (ARDL), the study found ICT to reduce poverty in Nigeria. Based on the China Family Panel Studies in 2018, Zhou et al. (2024) found similar results to Kakeu, Wendji and Kouhomou (2024) and Zhang et al. (2024) in a study on the impact of digital literacy and poverty alleviation. Garcia-Mora and Mora-Rivera (2023) found that internet access contributes to poverty reduction in a sample of people living in contrasting regions across rural Mexico. Xie, Zhang and Shao (2023) examine the impact of internet use on relative poverty among farmers with different income structures in China. Using the China Family Panel Studies data and employing the Probit model, the study confirmed that internet use significantly reduces the probability of farmers slipping into relative poverty. Internet use was found to have a better effect on full-time farmers compared to part-time farmers.

In the same vein, Phan (2023) studied the impact of internet use on poverty in Vietnam using data from 2008 to 2016. The study used GMM and Propensity Score Matching. The results confirmed a positive contribution of internet use to poverty reduction. Gu et al. (2023), in a study on poor counties in China using panel data from 2012 to 2018, found ICT to contribute positively to poverty reduction. Galperin, Katz and Valencia (2022) found broadband deployment in rural areas was associated with gains in labour income and employment in a study on Ecuador using data from 2011 to 2019. Spulbar et al. (2022) investigated the impact of ICT on poverty across 35 countries using data from 2005 to 2018. Employing the GMM vector autoregressive model, the study found that an increase in ICT leads to poverty reduction. Kwilinski, Vyshnevskiy, and Dzwigol (2020) examined the relationship between ICT, poverty, and social exclusion in European Union (EU) member states. The study found EU countries with higher digitalization to have a lower percentage of the population at risk of social exclusion and

poverty. Higher digitalization was found not to provide risk reduction of poverty and social exclusion. Mbuyisa and Leonard (2016) reviewed literature on the relationship between ICT, small and medium enterprises and poverty. The literature pointed to ICT being used as a tool for poverty reduction.

Apart from studies that found ICT to reduce poverty, there is a strand of literature that found ICT to worsen poverty reduction. Bergantino, Mario and Nademi (2025), in a study on 28 European countries, using Generalized Method of Moments (GMM) and data from 2012 to 2022, found ICT to increase poverty. Similarly, Dzator et al. (2023) in a study on 44 Sub-Saharan African countries using data from 2010 to 2019 and employing the dynamic system-generalized method of moments, found that mobile and telephone penetration and ICT goods imported resulted in poverty reduction. The study also found that internet and broadband penetration and ICT goods exported resulted in an increase in poverty, regardless of age or gender.

The reviewed literature provides overwhelming evidence that ICT leads to poverty reduction. However, there is a strand of literature that points to ICT worsening poverty reduction. Moreover, the studies reviewed assumed the impact of ICT on poverty reduction is symmetric. Thus, a relook on the impact of ICT on poverty reduction using non-linear autoregressive distributed lag provides more informative policy insights.

3. Estimation Techniques

The study employed the non-linear autoregressive distributed lag (NARDL) model to examine the impact of ICT on poverty reduction in South Africa over the period from 1983 to 2021. Unlike the autoregressive distributed lag that assumes positive and negative changes in the independent variable have the same effect on the dependent variable, the NARDL allows an examination of the impact of the independent variables for both positive and negative changes. The approach provides more insight into the nature of the relation between the dependent and independent variables. In addition, the approach is beneficial to policies that are time bound, as the impact of the independent variables is captured in the short and long run time frames. The NARDL has an added advantage of allowing a mixture of variables that are integrated in levels or first order, although the approach falls away if variables are integrated of a higher order than one.

Table 1: Variable Definition

Variable Name	Variable Definition	Data Source
POV	Household consumption expenditure	World Bank https://datacatalog.worldbank.org
OPEN	[Exports plus imports]/GDP	WDI
EXR	Real Effective Exchange rate	WDI
y	Economic Growth (GDP per capita growth)	WDI
Urbpop	Urban population ratio	WDI

ICT	Fixed telephone subscriptions (per 100 people)	World Bank https://datacatalog.worldbank.org/public-licenses#cc-by

Note: WDI = World Development Indicators

Model Specification

The general model specification is given in Equation 1.

$$POV = f(ICT, OPEN, EXR, y, Urbpop) \dots \dots \dots (1)$$

Where:

POV = poverty captured by household consumption expenditure per capita

ICT= captured by fixed telephone subscriptions per 100 people

OPEN= Trade openness

y = economic growth

EXR = Real Effective Exchange rate

Urbpop = Urbanization (% of total population)

The positive and negative decompositions of information and communication technology (ICT) in Equation 2 are presented in Equations 3 and 4, respectively.

$$ICT_t = \rho_0 + ICT_t^+ + ICT_t^- \dots \dots \dots (2)$$

Where:

$$ICT_t^+ = \sum_{j=1}^t \Delta ICT_t^+ = \sum_{j=1}^t \max(\Delta ICT_j; 0) \dots \dots \dots (3)$$

$$ICT_t^- = \sum_{j=1}^t \Delta ICT_t^- = \sum_{j=1}^t \min(\Delta ICT; 0) \dots \dots \dots (4)$$

Based on the equations above, the NARDL model can be expressed as:

$$\begin{aligned} \Delta POV_t = & \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta POV_{t-i} + \sum_{i=0}^{q1} \beta_{2i}^+ \Delta ICT_{t-i}^+ + \sum_{i=0}^{q2} \beta_{3i}^- \Delta ICT_{t-i}^- + \sum_{i=0}^{q3} \beta_{4i} \Delta OPEN_{t-i} \\ & + \sum_{i=0}^{q4} \beta_{5i} \Delta y + \sum_{i=0}^{q5} \beta_{6i} \Delta Urbpop_{t-i} + \sum_{i=0}^{q6} \beta_{7i} \Delta EXR_{t-i} + \vartheta_1 POV_{t-1} \\ & + \vartheta_2^+ ICT_{t-1}^+ + \vartheta_3^- ICT_{t-1}^- + \vartheta_4 OPEN_{t-1} + \vartheta_5 y + \vartheta_6 Urbpop_{t-1} \\ & + \vartheta_7 EXR_{t-1} + \mu_{1t} \dots \dots \dots (5) \end{aligned}$$

Where:

β_0 = constant; $\beta_1 - \beta_7$ = short-run coefficients; $\vartheta_1 - \vartheta_7$ = long-run coefficients; and μ_{1t} = error term.

Equation 6 presents the NARDL error correction representation of Equation 5.

$$\begin{aligned} \Delta POV_t = & \beta_0 + \sum_{i=1}^p \beta_{1i} \Delta POV_{t-i} + \sum_{i=0}^{q1} \beta_{2i}^+ \Delta ICT_{t-i}^+ + \sum_{i=0}^{q2} \beta_{3i}^- \Delta ICT_{t-i}^- + \sum_{i=0}^{q3} \beta_{4i} \Delta OPEN_{t-i} \\ & + \sum_{i=0}^{q4} \beta_{5i} \Delta y + \sum_{i=0}^{q5} \beta_{6i} \Delta Urbpop_{t-i} + \sum_{i=0}^{q6} \beta_{7i} \Delta EXR_{t-i} \\ & + \lambda ECM_{t-1} \dots \dots \dots (6) \end{aligned}$$

Where:

ECM = Error correction term.

4. Empirical Results

Before proceeding with the NARDL analysis, Dickey-Fuller Generalized Least Squares (DF-GLS) and Phillips-Perron (PP) stationarity tests were conducted to determine the stationarity of the variables included in the model. The stationarity test results are presented in Table 1.

Table 2: Unit root test results

Variable	Dickey-Fuller Generalized Least Square (DF-GLS)		Phillips-Perron (PP)	
	Level	Δ	Level	Δ
POV	-0.1020	-3.9330**	-1.6225	-4.8032***
ICT	-1.0902	-5.0444***	1.0792	-4.1752***
OPEN	-1.7583	-5.0103***	-0.2517	-6.8409***
y	-1.8684	-4.4558***	-0.7441	-4.5636***
Urbpop	-9.4186***	-	-2.1036	-6.5146***
EXR	-1.7782	-5.6623***	-7.3039***	-

Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively.

Δ denotes first difference.

Results reported in Table 2 confirmed that all the variables in the model are stationary in levels or first difference. The next step is to establish if the variables have a long-run relationship. Cointegration results are presented in Table 3.

Table 3: Cointegration Results

Dependent variable	F-Statistic				Cointegration Status	
POV	4.213063 ***				Cointegrated	
Asymptotic critical values						
	10%		5%		1%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	2.254	3.388	2.685	3.960	3.713	5.326

Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% levels

To determine long-run relationships, the calculated F-statistics is compared to the critical values also presented in the table at 1%, 5% and 10% level of significance. If the F-statistic is above the upper bound, cointegration is confirmed, and if the calculated F-statistic is below the lower bound, no long-run relationship is determined; however, if the F-statistic falls between the lower bound and the upper bound, the results are inconclusive. The F-statistic of 4.213063 falls above the upper bound critical value of 3,960 at 5% level of significance, confirming the presence of a long-term relationship among the variables in the model. Before proceeding with the analysis, a short-run and long-run asymmetry test was conducted to confirm if ICT has a non-linear relationship with poverty reduction. The results are reported in Table 4. The results confirmed the

presence of long and short run asymmetry.

Table 4: Long and short-run asymmetric test results

Test	F-statistic	P-value	Decision
WLR	3.799681*	0.0662	Asymmetric
WSR	6.996841**	0.0160	Asymmetric

1) *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively

2) = long-run asymmetric test

3) = short-run asymmetric test

The presence of long-run and short-run asymmetry in the model allows for the analysis of the impact of ICT on poverty reduction using the NARDL approach. The NARDL results are presented in Table 5.

Table 5: NARDL results

Dependent Variable is DPOV		
Panel A: Long-Run Results		
Regressor	Coefficient	T-ratio [p-value]
ICT^+	38.32756*	1.717566 [0.0955]
ICT^-	5.543705	0.650287 [0.5201]
$OPEN$	1.885301	0.309458 [0.7590]
y	0.594800***	7.853707 [0.0000]
$Urbpop$	43.42222***	3.425369 [0.0017]
EXR	5.986109***	2.743981 [0.0099]
C	-3650.141***	-5.065710 [0.0000]
Panel B: Short-Run Results		
Regressor	Coefficient	T-ratio [p-value]
ΔICT^+	61.15070**	2.515510 [0.0184]
$\Delta ICT^+(-1)$	-28.66801	-1.187237 [0.2459]
ΔICT^-	-4.818704	-0.626160 [0.5367]
$\Delta ICT^-(-1)$	-3.234638	-0.381010 [0.7063]
$\Delta OPEN$	4.387127**	2.598865 [0.0152]

$\Delta OPEN(-1)$	-0.021719	-0.012554 [0.9901]
ΔY	0.574993***	12.58040 [0.0000]
$\Delta Y(-1)$	-0.021570	-0.542906 [0.5918]
$\Delta Urbpop$	185.6252	1.265559[0.2169]
$\Delta Urbpop(-1)$	268.4678	1.652443 [0.1105]
ΔEXR	2.890272***	4.496442 [0.0001]
$\Delta EXR(-1)$	-1.540036*	-1.959835 [0.0608]
$ECM(-1)$	-0.811718***	-6.7791315 [0.0000]
Panel C: Test statistics and diagnostics		
R- Squared	0.959805	
R-Bar-Squared	0.941254	
F-statistics [Prob]	51.73748 [0.000000]	

- 1) *, ** and *** denote statistical significance at 10%, 5% and 1% levels, respectively
- 2) (+) and (-) denote positive and negative shocks, respectively.

The results presented in Table 5, Panel A and Panel B, confirm that positive changes in ICT are positively associated with poverty reduction in both the long run and the short run. This was confirmed by the coefficients of ICT^+ and ΔICT^+ , which are positive and statistically significant at the 10% and 5% levels, respectively. Negative changes in ICT were, however, found to have no significant impact on poverty reduction. This was confirmed by the coefficient of ICT^- , which was found to be insignificant in the short run and in the long run. The dynamic multiplier graph also confirms that positive shocks in ICT have a more profound and lasting effect on poverty reduction compared to negative shocks.

Other results presented in Table 5 confirmed that: i) Trade openness (OPEN) has a positive impact on poverty reduction only in the short run. The results point to the positive contribution that trade brings to the poor through channels like the availability of a variety and quality goods at a lower price. ii) Economic growth (y) has a significant and positive impact on poverty reduction in South Africa in both the short run and the long run. Economic growth is associated with job creation and the availability of more resources to the government to expand the outreach programmes targeting the poor. iii) Urban population (Urbpop) was found to have a positive impact on poverty reduction only in the long run. iv) Real effective exchange rate (EXR) was found to have a positive impact on poverty reduction in the long run, while in the short run, the results are inconclusive.

The variables included in the model explain 96% of the variability in poverty reduction. The error correction term (ECM) of -0.811718 was found to have the expected negative

sign and was significant at 1%. This implies that the model is convergent: whenever there is a disequilibrium in the economy, the model always converges to the equilibrium at a speed of 81% percent annually. Figure 2 captures the dynamic multiplier graph, and Figure 3 reports the cumulative sum and cumulative sum of square (CUSUM and CUSUMQ). The CUSUM and CUSUMQ confirmed that the model is stable at 5% level of significance.

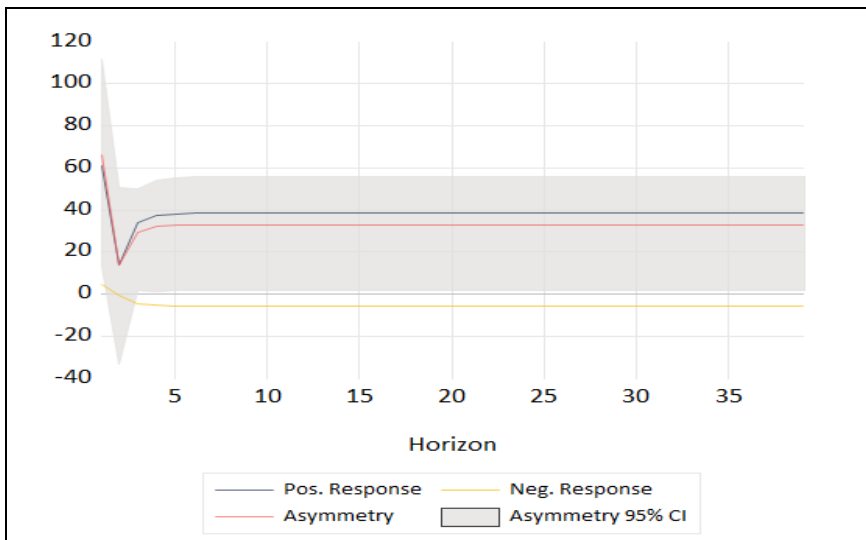
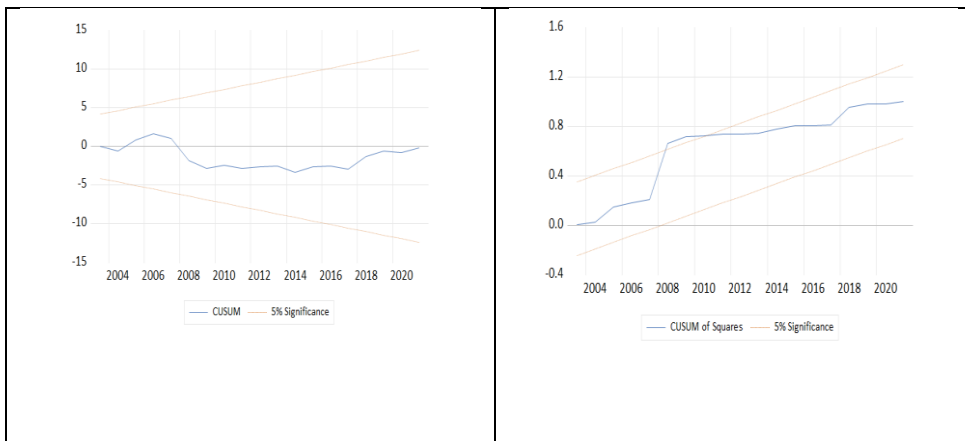


Figure 2: Dynamic Multiplier Graph



Note: 5% level of significance

Figure 3: CUSUM and CUSUMQ

5. Conclusion

This study investigated the asymmetric impact of ICT on poverty reduction in South Africa, using data from 1983 to 2021 and a non-linear ARDL approach. The

simultaneous occurrence of high poverty levels and notable advancement in ICT in South Africa motivated this study to establish whether South Africa can harness ICT to alleviate poverty. Poverty reduction was captured by household consumption expenditure, while ICT was measured by fixed telephone lines per 100 people. The findings from the study confirmed that positive changes in ICT are positively associated with poverty reduction in both the long run and the short run. Negative changes in ICT were, however, found to have no significant impact on poverty reduction. The dynamic multiplier graph confirmed that positive changes in ICT have a more profound and lasting impact on poverty reduction compared to the negative changes. We can, therefore, conclude that ICT has a beneficial impact on poverty reduction in South Africa. Based on the findings, South Africa is encouraged to continue to provide the requisite legislative framework necessary to support fair and competitive participation in the ICT sector. Further, South Africa is encouraged to continue pursuing private partnerships to accelerate ICT access in underserved areas, especially rural areas. Awareness campaigns are also suggested to build awareness on ICT options available and their affordability, benefits, and how ICT can be used to alleviate poverty among South Africans.

Although steps have been taken to ensure the scientific rigor of this study, a few limitations can be pointed out. Firstly, poverty is multidimensional; the current study used income poverty. Future studies can benefit from the use of other poverty measures. Secondly, ICT is broad; fixed telephone lines per 100 people were used as a measure of ICT. Future studies can use other measures of ICT, which may provide another view on the nature of the link between ICT and poverty reduction. Lastly, the study period for this study was restricted due to data availability; as new data become available, future studies can benefit from an expanded data set.

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EXPLORING POVERTY TRAPS: INSIGHTS FROM A CONTENT ANALYSIS OF CONTEMPORARY ECONOMIC RESEARCH

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Abstract: *The presentation of theoretical aspects related to the determinants of poverty contributes to an in-depth understanding of the relationship between development and poverty. Given that poverty can be a self-perpetuating situation, I considered it necessary to carry out a detailed analysis of its determinants, both at the level of the individual and at the level of society as a whole. Thus, the paper aims to provide a perspective into how these determinants can influence poverty levels and limit economic development.*

In accordance with the literature, this paper highlights that poverty is the result of a combination of interconnected factors, which can generate a vicious circle that is difficult to break in the absence of a holistic view of this phenomenon. Solving it requires complex and strategically directed interventions.

Keywords: *poverty, economic development, determinants of poverty*

JEL classification: *A14, O11, I32*

1. Introduction

Poverty is a complex and multidimensional phenomenon, influenced by a wide range of determinants that vary from country to country and from region to region, which is also reflected in specialized papers (Collier, 2008; Bartle, 2013; Walker & Bantebya-Kyomuhendo, 2014; Sowell, 2016; Brady, 2019). Most poverty researchers address a single case, a country or a region, studying a small number of the determinants of this phenomenon, although certain factors can often be associated with the perpetuation of poverty in many contexts.

Collier (2008) discusses the obstacles – geographical isolation, natural resources, conflicts, poor governance – that hinder productivity growth in the poorest countries. Bartle (2013) identified five factors that contribute to the persistence of poverty: ignorance, illness, apathy, dishonesty and dependence, and in order to overcome these factors, education plays a decisive role, namely the transmission of those pieces of information and knowledge within the group, which contribute to the eradication of poverty in a community. Walker and Bantebya-Kyomuhendo (2014) argue that poverty is relational, in the sense that the experience of poverty is determined by both third parties and oneself. That is, these authors consider that poverty is the consequence of social structures and institutions. Sowell (2016) examines economic inequalities in detail. His basic idea is that poverty is not only a consequence of the current economic system, but is rooted in the culture, history, geographical characteristics and political

factors of different regions. Brady (2019) classifies the causes of poverty into three major families of theories: behavioural, structural, and political. Thus, the factors that can determine the level of poverty of a community can be classified as follows (**Table 1**):

Table 1: Determinants of poverty identified in the theories presented by Brady (2019)

Determinants of poverty according to behavioural theories	Determinants of poverty according to structural theories	Determinants of poverty according to political theories
- Counterproductive behaviours that increase poverty - Single-parent families (maternity) - Problematic behaviour among minorities - Children born from extramarital relationships - Low level of education - Unemployment - Culture - Incentives (aids) - New culture of poverty	- Economic environment - Industrialization/deindustrialization - Territorial differences (demographic context) - Mismatch of skills with the labour market requirements - Age - Gender - Residential segregation (poor neighborhoods) - Concentration of urban poverty - Demographic transitions	- Power relations - Method of distribution/redistribution of resources - Degree of unionization - Risk insurance - Educational system (investments in skills and abilities) - Health system - Opportunities created in the labour market

Source: Created by the author, based on: Brady, D. (2019)

As far as Romania is concerned, the World Bank report (2003) carried out with the purpose of assessing poverty is relevant. In this report, the main elements associated with poverty are the following: household size (the risk of poverty increases among families with 5 or more members), number of children (the greater the number of children, the greater the risk of families being poor), age (the most vulnerable being the children), membership in the Roma ethnic group, the characteristics of the head of the household (households headed by women being more vulnerable, or a person with a low level of education, or who is self-employed or unemployed), residence in rural areas and in the north-eastern region of the country.

In a study about poverty conducted for the Bucharest area, Paraschiv (2008) demonstrated that employment and education are the main determinants of poverty, regardless of the residence environment or the type of poverty. As such, any anti-poverty strategy must focus on developing and diversifying the labour market, facilitating access to the labour market for disadvantaged groups and improving the situation of the educational system.

The studies conducted by Ștefănescu and Pop (2016), performed among the rural population of the Bihor – Hajdú-Bihar cross-border area (Hungary), have shown that the lack of jobs, poor education and poor infrastructure are the main factors that generate the perpetuation of poverty.

Ulman and Căuțișanu (2020) showed that resource productivity and domestic material consumption, size of the agricultural holdings, and social protection expenditure remain significant in terms of their influence on poverty.

Thus, the literature does not provide a more complex classification of the determinants of poverty, although they can be grouped into several main categories such as: economic factors, educational factors, health factors, social and demographic factors, political and institutional factors, geographical and environmental factors, cultural factors and historical factors.

2. Methodology

In order to provide an overview of the complexity of the addressed topic, I conducted a content analysis of the scientific papers selected from Google Academic and ResearchGate, published between 2000 and 2024, searching for the expression "determinants of poverty". I believe that using this method of documentation contributes to consolidating the theoretical basis regarding the determinants of poverty by providing an understanding of the topic addressed.

3. Results

3.1 Economic factors

Among the most frequently addressed determinants of poverty are those in the economic field. Thus, unemployment and lack of job opportunities, underemployment directly contribute to poverty, as limited or unstable incomes prevent access to essential resources (Moller et al., 2003; Rainwater & Smeeding, 2003; 2012; Brady et al., 2017). Low productivity is another important determinant, being the result of some complex factors such as deindustrialization and lack of advanced technologies (Mouw, 2000), the absence of adequate infrastructure, poor quality education and health care, the lack of stable economic policies (fiscal and social protection policies). Inflation and the destabilizing effects of rising prices have a negative impact primarily on the poor, reducing their ability to cover basic expenses (Easterly, 2002; Hayek & Caldwell, 2014; Buheji, 2022) worsening social inequalities (Stiglitz, Sen, & Fitoussi, 2009) and pushing vulnerable populations into poverty. The lack of investment as a determinant of poverty appears in several papers dealing with poverty trap theory (Carter & Barrett, 2006; Banerjee & Duflo, 2011; Carter & Lybbert, 2012; Gennetian & Shafir, 2015). This scourge creates inadequate incentives that undermine motivations to invest in education and insurance, which could subsequently reduce poverty. Although no one disputes the importance of investment, Easterly (2002) showed that capital transfers to underdeveloped countries are not a cure-all for poverty. The study conducted by Buheji (2022) draws attention to the fact that the pandemic and the Russian-Ukrainian conflict are causing a strong inflation, unseen in the last two decades, which will strongly affect the poor so that the progress achieved in the last decade in eradicating poverty may disappear.

3.2 Educational factors

In the literature, education is mentioned as one of the most important determinants of poverty (Alkire and Santos, 2013; Brady, 2016; Samuel et al., 2018; Easterly 2002) having a profound impact on income, employment chances and social mobility.

Limited access to quality education and high vocational training or early school leaving perpetuate the cycle of poverty, as people without adequate education are less likely to access well-paid jobs (Guo & Harris, 2000; Sachs, 2006; Sharkey, 2013; Sowell, 2016; Hanushek, 2020), which undermines education and leads to adult poverty.

Low quality of education can become a poverty trap limiting the development of the skills necessary for getting out of poverty (Esterley, 2002; Ravallion, 2016). Economic mobility is supported by a solid education, providing individuals with the necessary skills to adapt to the changes in the labour market and pursue better opportunities. Sowell (2016) draws attention to the importance of professional training appropriate to the demands of the labour market, showing that the years of schooling alone are not a factor of guaranteed success, it is essential that the chosen profile and specialization provide training in economically valuable skills.

Therefore, education is one of the powerful tools for poverty reduction, and investments in accessible and quality educational systems are essential to combat this phenomenon.

3.3 Health factors

The role of health on a person's poverty or even on the development of society as a whole is undeniable. Studies conducted by Deaton (2003) show a close interdependence between education-health-poverty. Infectious diseases and epidemics (HIV/AIDS, malaria, COVID 19 and the Omicron variant) generate disruptions in the economic activity disproportionately affecting poor communities, aggravating poverty through economic and social losses (Case & Deaton, 2022, World Bank 2022). Specialists unanimously agree that both the healthcare system and the individual health directly and indirectly influence poverty, as such they produce serious expenses and consequences at both the micro and macroeconomic levels (Sachs 2006; Suhrcke, et al., 2012; Jamison, et al. 2013; World Bank, 2022).

3.4 Social and demographic factors

Discrimination and social exclusion are essential factors that not only contribute to the persistence of poverty but affect both the discriminated person and communities as a whole, contributing to the maintenance of perpetual cycles of poverty and inequality. Ethnically, racially and religiously marginalized groups are often excluded from economic and educational opportunities, thus perpetuating the cycle of poverty (Piketty, 2014; Kaida&Kaida, 2016; Milazzo & Van de Walle, 2017; Cruz and Ahmed, 2018; Sen, 2000).

Family structure is another determinant with an important impact on poverty. Specialist studies show that among the most vulnerable groups, in terms of poverty, are large families and single-parent families (World Bank, 2003; Gibson-Davis et al., 2005; Burton et al., 2009; McLanahan, 2009; Lichter et al., 2012;) as well as female-headed households (World Bank, 2003; Rainwater & Smeeding, 2003; Kohler et al., 2012).

The birth rate can perpetuate poverty, particularly through some interconnected economic and social mechanisms. The high birth rate affects communities in less developed countries, as it puts pressure on the available resources and limits access to education and health services. On the other hand, the countries of the European Union

(Eurostat, 2024) are facing a demographic crisis, registering a continuously decreasing birth rate and this phenomenon leads to:

- an ageing population, which can put pressure on pension and social security systems, leading to more limited financial resources to support the poor and vulnerable;
- the decrease in the number of people active in the economy in the long term, which can limit economic growth, innovation and productivity, thus negatively impacting an economy's ability to reduce poverty;
- the concentration of resources in the hands of a limited number of families or individuals, perpetuating inequalities and therefore poverty;
- a culture of individualism and competition, which can reduce social solidarity and this can make community support for impoverished people much more difficult, hindering poverty reduction programmes;
- additional social and economic pressures on the working population in the labour market, and these pressures can directly affect the living standards and purchasing power of communities, thereby increasing poverty;
- deficient public policies due to the temptation to allocate resources to programmes that meet the needs of an older population, rather than to programmes aimed at young people and young families. This can lead to the underfunding of education, social assistance and other programmes essential for poverty reduction.

Therefore, it is fundamental that public policies through governmental and non-governmental institutions address these challenges in order to promote sustainable and equitable development that reduces poverty.

3.5 Political and institutional factors

Among the determinants in the area of political and institutional factors are: government policies (Sowell, 2016), political instability and conflicts (Collier, 2008, Buheji, 2022), corruption and ineffective governance (Easterly, 2002; Acemoglu & Robinson, 2012), inequalities (Soss et al., 2011; Huber & Stephens, 2012; Watkins-Hayes & Kovalsky, 2016; Michener, 2018), social protection systems. Institutions have a decisive role to play in maintaining or escalating poverty in the long term. For example, historical institutions such as slavery, colonialism (O'Connell, 2012; Acemoglu & Robinson, 2012; Bhattacharyya, 2016) and federalism (Allard, 2017; Michener, 2018) contribute to the perpetuation of racial inequalities, generating poverty, while stable, long-term democratization is associated with lower poverty (Sen, 1999; Huber & Stephens, 2012). This explains why the global economic hierarchy of countries is so stable – countries that were rich and poor a century ago remain rich and poor today. Acemoglu and Robinson (2012) claim that economic and political institutions are essential for increasing productivity and prosperity, showing how weak and corrupt institutions can limit productivity and perpetuate poverty, even in countries with rich natural resources.

Thus, an effective governance, well-designed economic policies and a strong social protection system are essential for addressing poverty and promoting the general well-being of the population.

3.6 Geographical and environmental factors

Geographical disparities have been identified as a major cause of poverty. Specialists have shown that segregation is poverty-inducing, demonstrating a direct relationship between this concept and the level of unemployment (Crowder & South 2005, Lichter et al. 2012, Pattillo & Robinson 2016), urban poverty (Ananat, 2011; Sharkey, 2013; Owens, 2015; Massey, 2016) or the rural one. Researchers emphasize that the unfavorable climate, scarce natural resources, geographical isolation, namely the limited access to natural trade routes (navigable rivers, seaports) fundamentally influence development and economic opportunities but also social structures, contributing to the maintenance of a high level of poverty (Sowell, 2016; Bhattacharyya, 2016; McAuliffe & Triandafyllidou, 2021; Kakwani, 2024; Sachs et al. 2019, 2024).

3.7 Cultural factors

Theories of poverty tend to present culture as an essential source of poverty (O'Connor, 2001; Dohan, 2003; Lichter et al. 2003; Bertrand et al., 2004; Harding, 2010; Durlauf, 2011; Katz, 2013; Levine, 2013; Sowell 2016). Many papers discuss the new culture of poverty (Lamont & Small, 2008; Harding, 2010; Steinberg, 2011; Dahl et al., 2014; Streib et al., 2016) explaining the counterproductive behaviour that causes poverty. A complex and more flexible approach to the relationship between culture and poverty is proposed, countering traditional ideas that viewed the culture of poverty as a fixed set of traits or limiting values with specific traits that prevent individuals from overcoming their economic condition.

According to Small et al. (2010), culture itself is not a direct determinant of the economic status, but predestines the individual towards a certain level of income. Therefore, through education, those values and skills, through which the individual can overcome the scourge of poverty, can be acquired, otherwise we would not have so many positive examples of success of people who come from disadvantaged cultural backgrounds.

3.8 Historical factors

Historical factors can play a decisive role in maintaining and perpetuating poverty, creating economic, social and political structures and conditions that affect access to opportunities and resources over several generations. Specialized studies show that in many countries poverty is linked to a historical legacy of colonization, exploitation and underdevelopment, conflicts and wars, which has created persistent structural inequalities. (Sowell, 2016; Baker, 2023).

Before drawing conclusions in Table 2, I have systematized several relevant ideas about the traps of poverty discussed in the literature.

Table 2: Factors perpetuating the poverty trap

Author	Title of the paper	Year	Factors of the poverty trap	Proposed solutions to eliminate poverty traps

William Easterly	"The Elusive Quest for Growth"	2002	- poor infrastructure - ineffective and unstable institutions - education and low-skilled human capital - limited access to financial markets	- decentralized approach, focused on free markets and local innovations - supporting self-sustaining capacity
Jeffrey Sachs	The End of Poverty,	2005	- lack of capital, education, health and infrastructure	- massive investments in education and health - infrastructure projects - external interventions
Paul Collier	The Bottom Billion,	2007	- armed conflicts - weak governance and institutions - geographical isolation - dependence on natural resources	- external aid and well-targeted policies
Abhijit Banerjee, Esther Duflo	Poor Economics	2011	- individual behaviours - resource constraints - economic decisions	- practical solutions, the "economy of small details" adapted to local and short-term needs - small economic incentives - microcredit and savings programmes - investment in early childhood education and in children's health
Daron Acemoglu, James A. Robinson	Why Nations Fail	2012	- weak political and economic institutions that limit economic opportunities and rights	- major institutional changes
Thomas Piketty	Capital in the twenty-first century: a multidimensional approach to the history of capital and social classes	2014	- capital concentrated in the hands of a small number of people - economic inequalities	- a progressive fiscal system - investment in education
Martin Ravallion	The economics of poverty: History, measurement and policy	2016	- lack of basic resources: health, education and access to finance	- investment in education, health and infrastructure - external investment - international aid
Duncan Green	How Change Happens	2016 (2024)	- lack of financial, human and social capital	- access to education, health and resources - job opportunities

			- lack of access to basic services - discrimination and structural inequalities	

Source: Made by the author, adapted after: Easterly, 2002; Sachs, 2005; Collier, 2007; Banerjee and Duflo, 2011; Acemoglu & Robinson, 2012; Piketty, 2014; Ravallion, 2016; Green, 2016, 2024;

4. Conclusions

To effectively address poverty, it is essential to understand the context and the specific factors that contribute to its persistence, as well as to promote community participation in the development and implementation of solutions. As Nunan (2015) mentions, poverty is caused by the complex interactions between economic, social and environmental factors and this type of approach must be taken into account in order to understand them correctly and, in this way, know the directions that need to be improved to address it. Green (2024) argues that in order to effectively address poverty, it is essential to understand the context and the specific factors that contribute to its persistence, as well as to promote community participation in the development and implementation of solutions.

Based on the studied papers, we can say that poverty can be a self-perpetuating situation, where the lack of resources prevents capital accumulation, productivity growth or investments in education and health care, which keeps people in a situation of economic and social precariousness restricting the ability to get out of poverty. The combination of determinants presented in this paper can become a trap of poverty, which reinforce each other, making extreme poverty difficult to overcome without external support or without significant changes in governance and policies.

Therefore, further research in this area is needed to find effective solutions to design policies and interventions that take into account the specific context of each community.

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MACROECONOMIC ANALYSIS OF THE COHESION FUND IN CENTRAL AND EASTERN EUROPE AT REGIONAL LEVEL

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Abstract: *European funds and their impact at regional level have gained significant attention because there is a desire to distribute funds as efficiently as possible and in such a way that regions benefit in proportion to their needs. The Cohesion Fund is the main instrument for supporting economic, social, and territorial development. However, the issue has been debated many times and no consensus has been reached. Some believe that the Cohesion Fund supports regional development, while others disagree. This paper therefore analyzes the impact of the Cohesion Fund on NUTS2 regional development in 11 countries in Central and Eastern Europe and how it achieves or fails to achieve its overall objective. The results show that an increase in the Cohesion Fund contributes to an increase in the composite indicator, which shows the result of the overall objective. In our analysis, the Cohesion Fund has a positive and significant impact on regional development and succeeds in achieving its overall objective.*

Keywords: *Cohesion Fund; panel analysis; Central and Eastern Europe; regional development*

JEL classification: *O18; R11; R58*

1. Introduction

In the context of regional differences in living standards, the paper analyzes whether the Cohesion Fund contributes to regional and economic development and whether, through the amounts allocated, it fulfills its overall objective. These differences lead to general inequality, which brings a certain degree of unfairness or injustice that can have social and political consequences (Breinlich et. Al, 2014). The question has often been raised as to whether the Cohesion Fund is allocated to regions in a way that benefits them, or whether the policy for allocating funds should be changed. At the same time, the analyzed area of Central and Eastern Europe is a region that has experienced conflicts, wars, and economic difficulties, which makes our analysis particularly relevant. The Cohesion Fund, created more than three decades ago, has always aimed to support the poorer regions of EU member states. It has various specific objectives depending on the multiannual financial framework. Between 2000 and 2006, the Cohesion Fund's priority was to support less developed EU countries with a GDP of less than 90% of the EU average, focusing on the environment, transport, and sustainable infrastructure (European Union, 2006). The 2007-2013 period added to transport and the environment, the reduction of regional disparities and sustainable projects (European Union, 2008). Between 2014 and 2020, the focus was on the transition to a

green economy, infrastructure, sustainable development, and economic and social cohesion (European Commission, 2025). The current framework, 2021-2027, shows a focus on the green transition, more connected and sustainable infrastructure, economic development, and social and territorial cohesion (European Union, 2024). Overall, the general priorities remain the same throughout the multiannual financial frameworks.

Some say that Structural Funds and Cohesion Fund allocations have a positive impact on regional development only up to a maximum investment value, after which they lose their impact. Thus, fund allocation could be improved by reducing transfers that exceed the maximum level (Cerqua and Pellegrini, 2017). One factor conditioning the impact of the Cohesion Fund on GDP per capita can be reflected in the country's inflation and public debt. Therefore, if a country has low inflation and moderate public debt, it benefits significantly from the Cohesion Fund (Dicharry et al., 2019). It has also been found that the main beneficiaries of the Cohesion Fund in a country are the most urbanized regions, such as capital cities (Mirošník et al., 2014). However, EU funds play an important role in regional development, but their effect may be diminished in the event of macroeconomic uncertainty (Pinar and Karahasan, 2024). Contrary to the positive benefits listed, there have also been studies that have said that investments from EU structural funds have not contributed to reducing regional disparities, and separate analysis of the funds has led to ambiguous results (Butkus et al., 2019). Hence, in this paper, we will analyze how the Cohesion Fund achieves its overall objective at the NUTS2 level: strengthening the economic, social, and territorial cohesion of the European Union (European Commission and Council, 2021).

The article is structured into separate sections. The first section consists of an introduction, which outlines the relevance of the Cohesion Fund and its impact so far. The second section presents the relevant theoretical framework for the proposed topic. The third section is the methodology, which describes the methods, data, and software used. The fourth section discusses the results of the methods applied and outlines the impact of the Cohesion Fund, followed by the last section, which draws the general conclusions of the article.

2. Literature Review

For the period 2000-2006, Crescenzi et al. (2008) found that 50% of the Cohesion Fund has been spent on infrastructure projects. At the same time, the authors noted that regions with better infrastructure tend to grow faster, but the positive impact is short-lived. Becker et al. (2012) conducted a generalized propensity score estimation to measure whether European Union funds stimulated development at the NUTS3 level between 1994 and 2006. The authors found that, overall, EU funds stimulate regional growth. However, 18% of regions experienced a decline, suggesting a more efficient allocation of funds. De Toni et al. (2021) highlighted the lack of territorial involvement in the distribution of European funds at the regional level. The authors believe that the lack of spatial concentration leads to regional development problems, especially for peripheral regions.

Regarding EU27, Shebanin et al. (2022) analyzed the value of Cohesion Fund financing during the period 2014-2020 and found a direct link to countries' GDP and gross value added. An increase in the Cohesion Fund leads to an increase in GDP and gross value added, but also to a decrease in the unit cost of labor. Scotti et al. (2022) used spatial panel analysis to examine the impact of structural and Cohesion Funds at the European

NUTS2 level for the period 2007-2014. The results of the study indicate economic growth and long-term benefits. The sectors that benefit most from these funds are infrastructure, research and development, energy, and human resources. In contrast, the environmental sector showed a slightly negative impact.

Based on an analysis of 56 regions in Central and Eastern Europe between 2007 and 2018, Tiganasu and Lupu (2023) concluded that regions have strengthened their socio-economic cohesion with the help of European funds such as the CF, ERDF, and ESF. Crucitti et al. (2023) present an unusual result. They show that the spillover effects of countries benefiting from the Cohesion Fund have a positive and long-term impact on 45% of countries that do not benefit from this fund. Giannini and Martini (2024) found that European Union funds, especially the Cohesion Fund, play a big role in the regional convergence of GDP per capita at the NUTS2 level between 2000 and 2021. Along with this, physical and human capital also help with convergence.

In addition to regional development, Kutun and Yigit (2007) found that cohesion and structural funds helped new members catch up with the living standards of member states and integrate economically. At the same time, Crucitti et al. (2023) have shown that the impact of Cohesion Policy is considerable in the less developed regions of the European Union. The Cohesion Fund has supported the reduction of socio-economic disparities, and its focus is on regions with low GDP per capita. In contrast, Petrakos et al. (2025) report that the Cohesion Fund appears to favor regions with better infrastructure quality and investment levels.

Calegari et al. (2021), in their study on the impact of cohesion policy on GDP per capita and on the overall well-being of society, find positive effects on well-being and education levels through the cohesion fund. Agnello and Pizzuto (2025) found that the absorption of European funds is declining from one multiannual financial framework to another. Most often, the money is invested in the last years of a multiannual financial framework, putting pressure on project completion and leading to inefficient allocation. At the same time, the authors' work shows that less developed regions have low absorption from the Cohesion Fund due to governance and institutional capacity.

Thus, the literature highlights the support provided by the Cohesion Fund for regional development, economic integration, and living standards, but also its limitations.

3. Methodology

Various econometric methods were used for this research, such as: (1) fixed effects panel regression analysis; (2) random effects panel regression analysis; (3) robust regression model; (4) Arellano-Bond model; (7) maximum likelihood regression; (8) Poisson model; (9) regression with instrumental variables. To test the robustness of the results, models such as XTPCSE (Panel-Corrected Standard Errors) and XTSSC were used.

The dependent variable was created as a composite indicator using principal component analysis (PCA) from: GDP, motorway length (km), and railway length (km). The independent variables include: the level of education of the population, population size, unemployment rate, and the amount allocated from the Cohesion Fund (see table 1). The variables were selected according to the general objectives of the Cohesion Fund from official sources such as Eurostat and European data (data.europa.eu).

Table 1 Description of dependent and independent variables

Dependent variable	
GDP_PPS per inhabitant	Gross domestic product (GDP) at current market prices by NUTS 2 region, expressed in Purchasing Power Standard (PPS, EU27 = 100), per inhabitant, at NUTS2 level
Motorways - km	Total length of motorways (kilometers) at NUTS2 level
Railways - km	Total railway lines in Kilometers, on NUTS2 level
Independent variables	
EU_Payment_annual	Annual payments from the EU Cohesion Fund to each NUTS2 region.
Population by education levels 3-8	Total population aged 25–64 with upper secondary, post-secondary non-tertiary, or tertiary education (levels 3–8), at NUTS2 level.
Population	Total population in the NUTS2 region.
Unemployment	Unemployment rate for population aged 15–74 years, at NUTS2 level.

The data was collected at NUTS2 level for 11 countries in Central and Eastern Europe (the Czech Republic, Poland, Croatia, Slovenia, Slovakia, Hungary, Romania, Bulgaria and the three Baltic States: Estonia, Latvia and Lithuania) for the period 2000-2022. The software used was Stata.

4. Results

The Cohesion Fund's overall objective is to reduce regional, economic, and social disparities among the regions of the Member States. In this way, it supports the overall harmonious development of the European Union. Using the methods employed, we can highlight the impact of the Cohesion Fund on economic growth and the factors that contribute most significantly to its impact.

Table 2 PCA analysis for the composite indicator

Variable	Obs.	Mean	Std. Dev.	Min	Max
Composite indicator	1,230	-9.53e-10	1.152652	-2.483758	5.360844

Table 2 shows the construction of the composite indicator consisting of: GDP, motorway length (km), and railway length (km). The number of complete observations of the three variables for the dependent variable is 1230. GDP had 1254 observations, motorway length (km) had 1254 observations, and railway length (km) had 1230 observations. The mean of the composite indicator is 0, with no overall positive or negative trend in the values. The standard deviation is close to 1, the values of the composite indicator being moderately spread around the mean. The minimum values are -2.48 and the maximum values are 5.36, showing the variation in the observations. The variables taken into account for constructing the composite indicator reflect the overall objective of the Cohesion Fund, namely investment in transport networks and financing projects in less developed countries in order to reduce economic and social disparities.

Table 3: Results of econometric analyses using Stata

	(1) ln_Y	(2) ln_Y	(3) ln_Y	(4) ln_Y	(5) ln_Y	(6) ln_Y	(7) ln_Y	(8) ln_Y	(9) ln_Y
	Xtreg (fe)	Xtreg (re)	Rreg	Xtabond	Xtpcse	Xtscc	Xtreg (mle)	poisson	iyreg
main									
ln_CF	0.00363*** (0.00104)	0.00371*** (0.00104)	0.00530*** (0.00135)	-0.000610 (0.000542)	0.00434** (0.00145)	0.00434 (0.00253)	0.00371*** (0.000680)	0.00414** (0.00147)	0.00434** (0.00145)
ln_Education	1.754*** (0.172)	1.741*** (0.170)	1.121*** (0.0587)	0.166* (0.0659)	1.189*** (0.0502)	1.189*** (0.0587)	1.742*** (0.0697)	0.910*** (0.0477)	1.189*** (0.0633)
ln_Population	-0.243 (0.204)	-0.211* (0.0998)	-0.188*** (0.0112)	-0.159*** (0.0408)	-0.178*** (0.00959)	-0.178*** (0.0169)	-0.212*** (0.0410)	-0.134*** (0.00900)	-0.178*** (0.0121)
ln_Unemployment	-0.0873*** (0.0115)	-0.0886*** (0.0116)	-0.127*** (0.00937)	-0.0130*** (0.00328)	-0.134*** (0.0108)	-0.134*** (0.0151)	-0.0885*** (0.00577)	-0.0919** (0.00705)	-0.134*** (0.0101)
L.ln_Y				0.891*** (0.0236)					
_cons	-2.827 (3.120)	-3.218* (1.501)	-0.787* (0.311)	1.742* (0.709)	-1.181*** (0.160)	-1.181** (0.390)	-3.208*** (0.746)	-1.714*** (0.225)	-1.181*** (0.336)
sigma_u _cons							0.198*** (0.0190)		
sigma_e _cons							0.0785*** (0.00163)		
N	1212	1212	1212	1101	1212	1212	1212	1212	1212
R ²	0.731	0.731	0.506		0.479	0.479			0.479

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The results in Table 3 show that the Cohesion Fund (ln_CF) has a positive and statistically significant impact on the dependent variable (ln_Y) in most models (with the exception of the Arellano-Bond model). Similarly, the level of education (ln_Education) positively and significantly influences ln_Y in all models, while population (ln_Population) and unemployment rate (ln_Unemployment) have a significant negative impact.

The estimated coefficients, ranging between 0.0036 and 0.0053, show that a 1% increase in Cohesion Fund allocations leads, on average, to an increase of approximately 0.004% in the composite indicator ln Y. This effect is robust across most estimation methods (fixed effects, random effects, MLE, robust models), confirming the positive contribution of European funds to economic convergence.

The first two models, fixed effects analysis and variable effects analysis, show that 80% of the variation can be explained by differences between regions. The most significant coefficients being the Cohesion Fund and the level of education of the population. Following the Hausman test, it can be observed that fixed effects panel analysis is favored over random effects panel analysis. Models 3 show similar coefficients to the fixed effects panel analysis, and the model mitigates the influence of outliers. Models 5 and 6 support the correction of autocorrelation and heteroscedasticity. The results of these two models confirm the general trends: the cohesion fund is positive and significant, the level of education has a strong positive impact, and the population size and unemployment rate have a negative influence. Model 4 shows us that past performance mostly explains current values. Also, in this model, the Cohesion Fund isn't statistically significant. The latest models confirm the effects of the other models.

In our analysis, we use NUTS2 level data for 11 countries in Central and Eastern Europe, the territorial level also used for the implementation of Cohesion Policy by the

European Commission. The use of NUTS2 data captures in detail the differences in regional development and the variation in the Cohesion Fund. The results of the analysis show a positive and significant effect of the Cohesion Fund on the composite indicator (GDP, kilometers of motorway, and kilometers of railway). The role of the Cohesion Fund in the convergence process is also confirmed. Although the magnitude of the results is modest, the dynamic model suggests that the actual effects manifest themselves gradually over time. Based on the results obtained, we can say that the Cohesion Fund plays an important role in regional development and achieves its overall objective.

5. Conclusion

Throughout the multiannual financial frameworks, the Cohesion Fund had well established objectives, adjusted to the needs of the regions and tailored to the lessons learned from previous financial frameworks. The literature shows that European Union funds contribute to stimulating regional development, including through a direct connection to GDP and gross value added in beneficiary countries (Becker et al., 2012; Shebanin et al., 2022; Giannini and Martini, 2024). The benefits of economic growth through the Cohesion Fund are long-term (Scotti et al., 2022). However, the lack of territorial involvement in the distribution of European funds at the regional level leads to development problems, especially for peripheral regions (De Toni et al., 2021). The Cohesion Fund has strengthened socio-economic cohesion by helping Member States to achieve the standard of living of Member States and general well-being (Kutan and Yigit, 2007; Calegari et al., 2021; Tiganasu and Lupu, 2023).

The Cohesion Fund's overall objective is to strengthen the economic, social, and territorial cohesion of the European Union. The variables used were closely linked to this objective. The data used at the NUTS2 regional level allowed for a more detailed picture of the variation in the effectiveness of the Cohesion Fund.

The models showed that an increase in Cohesion Fund allocations leads to an increase in the composite indicator, which represents the outcome of the overall objective. In this paper, we found an unexpected result in the fact that the level of education has a strong impact on regional performance. Our expectations were focused on variables such as GDP, regional governance, infrastructure, etc. At the same time, regions with a large population tend to have a significant negative effect, most likely due to a lack of infrastructure. Infrastructure risks to be insufficient due to population growth. The unemployment rate is also negative, contributing to reduced economic performance and even infrastructure.

The results show the contribution of this fund to the development of NUTS2 regions in the 11 countries of Central and Eastern Europe and their economic convergence. Although the scale of the results can be described as modest, the real effects are gradually becoming apparent over time. Thus, we can conclude that in the analyzed territory, the Cohesion Fund has a positive and significant impact on the regions and at the same time manages to achieve its proposed objective.

The study is limited by the fact that the effects of the funds may be delayed over time and cannot be fully captured by the models used.

Appendix

Table 4 NUTS 2 regions of CEE

Czech Republic CZ01 Praha CZ02 Střední Čechy CZ03 Jihozápad CZ04 Severozápad CZ05 Severovýchod CZ06 Jihovýchod CZ07 Střední Morava CZ08 Moravskoslezsko Poland PL11 Łódzkie PL12 Mazowieckie PL21 Małopolskie PL22 Śląskie PL31 Lubelskie PL32 Podkarpackie PL33 Świętokrzyskie PL34 Podlaskie PL41 Wielkopolskie PL42 Zachodniopomorskie PL43 Lubuskie PL51 Dolnośląskie PL52 Opolskie PL61 Kujawsko-Pomorskie PL62 Warmińsko-Mazurskie PL63 Pomorskie Hungary HU10 Közép-Magyarország HU21 Közép-Dunántúl HU22 Nyugat-Dunántúl HU23 Dél-Dunántúl HU31 Észak-Magyarország HU32 Észak-Alföld HU33 Dél-Alföld	Croatia HR03 Jadranska Hrvatska HR04 Kontinentalna Hrvatska Slovakia SK01 Bratislavský kraj SK02 Západné Slovensko SK03 Stredné Slovensko SK04 Východné Slovensko Slovenia SI01 Vzhodna Slovenija SI03 Zahodna Slovenija Bulgaria BG31 Severozapaden BG32 Severen tsentralen BG33 Severoiztochen BG34 Yugoiztochen BG41 Yugozapaden BG42 Yuzhen tsentralen Estonia EE00 Eesti Latvia LV00 Latvija Lithuania LT00 Lietuva Romania RO11 Nord-Vest RO12 Centru RO21 Nord-Est RO22 Sud-Est RO31 Sud - Muntenia RO32 București - Ilfov RO41 Sud-Vest Oltenia RO42 Vest

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EXPLORING CIRCULAR ECONOMY INSIGHTS TOWARDS SUSTAINABLE DEVELOPMENT: A BIBLIOMETRIC ANALYSIS

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Abstract: *The circular economy is one of the most important topics in addressing the world's environmental problems, aiming to achieve a sustainable future. We are witnessing an increase in awareness of the need to use circularity principles and in the degree of implementation of the circular economy practices by both the business environment and the society in response to the policies practiced by public authorities, mainly in the European Union and China. The need for research on this topic stems from the momentum the concept has gained over the last decade. Using VOSviewer software, our research consists of a bibliometric analysis based on a sample of 9,912 articles published in the last decade, extracted from the Web of Science database. The objective of our analysis is to provide answers regarding the interest in investigating the topic of circular economy in the context of achieving sustainable development. Countries like Italy, China, and England hold the supremacy in terms of the number of papers published and total number of citations, highlighting their important role in research and advancements of the analyzed topic. Researchers from these countries are also heavily engaged in international collaborations with authors from other countries. A few journals dominate regarding the number of publications on this topic and the number of citations of publications, namely the Sustainability journal, the Journal of Cleaner Production, Business Strategy and the Environment journal, and the Resources Conservation and Recycling journal. The research directions in the field can be highlighted through the main themes targeted that, according to our results, are life cycle assessment, recycling, waste management, industry 4.0, environmental sustainability, business models, bioeconomy, innovation, industrial ecology, industrial symbiosis, climate change, and supply chains. We can also highlight the multidisciplinary character of the concept of the circular economy and, consequently, the widespread research directions, with the most papers published in areas like Environmental Sciences Ecology, Science Technology, Engineering, Business Economics and Energy Fuels.*

Keywords: *circular economy; sustainable development; bibliometric analysis.*

JEL Classification: Q01; Q56

1. Introduction

The planet Earth is over 4.5 billion years old, during which time it has undergone continuous transformations. Initially, it was a burning inferno without even an

atmosphere, and now we find it as a life-sustaining planet with continents and oceans (Becker, 2014). However, as the planet is in constant flux, the way humanity acts is a subject for analysis. The concepts of sustainable development and sustainability are always relevant, being frequently associated with the circular economy, which addresses the need to minimize humanity's influence on the planet's changes. In response to the global environment challenges in 2012, within a memorandum prepared by members of the European Resource Efficiency Platform, part of the European Commission, the need to implement a system based on regeneration and resource efficiency called the circular economy is discussed, characterized by a systemic change in the way resources are used and recovered, resulting in a reduction in dependence on imports (European Commission, 2012). Therefore, a relationship between the circular economy, including its instruments, and improving sustainability can be highlighted, as Maeder and Fröhling (2024) agree upon.

The objective of our study is to explore, through a bibliometric approach, the interest of researchers regarding the analysis of how the circular economy is linked to achieving sustainable development.

2. Theoretical background

The inspiration for the concept of the circular economy can be considered the cycles found in nature, such as the water cycle or nutrient cycles, based on the principle that elements useless to some become resources for others (Stahel, 2016).

Pearce and Turner (1990) published a book whose main subject is the economics of resources and the environment, with the second chapter titled "The Circular Economy." Even though it was a concept in its early stages, the authors delve into the relationship between the environment and the economy.

Despite the fact that the term circular economy is not explicitly mentioned in this form, the principles on which it is based appear frequently in works over time. For example, the principle of the closed-loop economy is mentioned by various authors (Lowe, 1993; O'Rourke, Connelly and Koshland, 1996; Ehrenfeld and Gertler, 1997), even if in connection with other concepts such as industrial ecology and environmental protection, as Yuan, Bi and Moriguichi (2006) also note that the circular economy is based on concepts such as cleaner production, industrial ecology, and ecological modernization. Thus, even if, terminologically, it is a new concept, the circular economy adopts some principles from concepts that existed before.

Defining and explaining conceptually the circular economy generally involves invoking the principles on which it is based. Kirchherr, Reike and Hekkert (2017) claim that it is "an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes" to achieve sustainable development for the purpose of creating a better environment, a prosper economy and equity in the society.

Murray, Skene, and Haynes (2015) describe the circular economy as one that has no net environmental impact, while also facilitating the regeneration of natural resources through extraction and ensuring production that generates minimal waste.

Zink and Geyer (2017) describe the circular economy as an approach focused on closing material loops to keep products, components, and materials circulating within the industrial system, thereby maximizing their utility.

Prieto-Sandoval, Jaca, and Ormazabal (2018) identify four key components of the circular economy:

- the continuous circulation of resources and energy through waste valorization and the reduction of resource demand;
- an approach implemented across multiple levels;
- the importance in achieving sustainable development;
- the close relationship with innovation.

Some authors consider the fundamental goal of the circular economy to be the decoupling of the pressure exerted on the environment from economic growth (Ghisellini, Cialani and Ulgiati, 2016). This approach can be further developed by decoupling economic growth from resource use (Pauliuk, 2018) and, consequently, maximizing their use and minimizing waste.

Cullen (2017) develops this idea, suggesting that the adoption of the circular economy will lead to a decrease in environmental impact by reducing resource use, but at the same time will facilitate the achievement of desired economic growth without resource depletion.

The principle of closing loops, circuits, or material flows represents the foundation of the circular economy concept, as mentioned by several authors (Stahel, 2010; Kirchherr, Reike, and Hekkert, 2017; Zink and Geyer, 2017; Geissdoerfer et al., 2018). Creating a system based on the circular economy involves the participation and effort of all actors in economic life: the business environment, consumers, and authorities (Lakatos et al., 2021). However, the success of achieving the environmental and economic objectives of the circular economy cannot be realized without the active participation of companies (Briguglio et al., 2021), which should develop products based on the principles of circularity, encourage education programs on the circular economy, and provide professional training for their own employees (Trevisan et al., 2023). At the social level, a significant change would be needed in the way individuals and collectives interact with nature, a change that must be profound and governed by principles such as care and respect for nature, and not by a relationship that denotes only its utilization (Nesterova and Buch-Hansen, 2023).

The practical way to close loops, circuits, or material flows is considered to be the application of the 3R concept. Adopting the principles of the circular economy offers assistance to decision-makers for the application of the concept. Specifically, the 3R concept is an instrument that is applied in the production and for optimizing the supply chain, by allocating resources at lower costs and generating minimal waste, concurrently with a high degree of reuse, remanufacturing, and recycling (Shabanpour et al., 2024).

This concept is one of the foundations of the circular economy model, with waste generated by economic activity being the primary focus of attention. Particular attention is paid to municipal waste, considered crucial in the foundation of the circular economy by Wang et al. (2023).

Stahel (2016) speaks of changing economic logic through the use of the circular economy and consequently replacing production with sufficiency using the 4R:

- reusing goods as much as possible;
- recycling goods that cannot be reused;
- repairing goods that are damaged;
- remanufacturing damaged goods that cannot be repaired.

Another practical way of implementation materializes in one of the strategies promoted at the European Union level and refers to products with high circularity potential, Product-as-a-Service, for improving durability, reuse, upgradeability, and reparability (Golinska-Dawson, Zysnarska and Pender, 2024), in which after-sales maintenance and repair services gain particular importance.

This strategy is considered preferable to remanufacturing, reconditioning, or recycling because it has a higher degree of circularity through its potential to maximize resource efficiency and productivity, as well as the use cycle of the good without the need for material recovery, having a beneficial impact on sustainability (Carissimi, Bin Hameed, and Creazza, 2024).

The involvement of authorities is also desirable through a re-evaluation of existing policies, the identification of legislative gaps, and the creation of a clear regulatory framework, even cross-border cooperation, to facilitate the implementation of circular economy practices (Mubarik, Kontoleon, and Shahbaz, 2024). A systemic approach is necessary, with circular economy policies and strategies being treated as a whole, not at an individual level (Carissimi, Bin Hameed, and Creazza, 2024).

Given the complexity of the circular economy concept and the high number of relationships with other concepts due to its wide scope, including the relationship with sustainable development and sustainability, the research of this concept has recently gained momentum, being analyzed from all perspectives, as will be seen in the study conducted based on bibliometric analysis.

3. Research methodology

Bibliometric analysis is based on quantitative techniques designed to facilitate performance analysis, on the one hand, and science mapping, on the other (Donthu et al., 2021). The objective of our study is to explore, through a bibliometric approach, the interest of researchers regarding the analysis of how the circular economy is linked to achieving sustainable development. Our scientific approach aims to generate answers to the following research questions:

RQ1. What is the evolution of the interest in investigating the circular economy topic in the context of achieving sustainable development?

RQ2. What countries have the highest productivity and impact in scientific research regarding the analysis of how the circular economy is linked to achieving sustainable development?

RQ3. What journals are the most influential, considering the scientific productivity and impact on the analyzed topic?

RQ4. What publications are the most cited in the analyzed topic?

RQ5. What are the international country collaborations in research publications on the topic of circular economy in the context of achieving sustainable development?

RQ6. What are the most relevant concepts, themes, and clusters for research on the circular economy-sustainable development topic?

Therefore, the Web of Science database was investigated to pursue our objectives. The database query was performed on March 29, 2025. The search process included several steps. The first step for dataset generation was a database search, considering the topic criteria which, for Web of Science, implies searching words in the title, the abstract, keyword plus, and author keywords of the documents. We aimed to ensure that our search would identify the most relevant articles to achieve the objectives of our study. The following search query was used:

("circular econom*" OR "circular* principles" OR "circular strateg*" OR "circular business*") AND ("sustainable development" OR "sustainable economic development" OR "sustainable development goals" OR "SDGs" OR "sustainability" OR "2030 Agenda for Sustainable Development")

We used the "*" symbol so that our search would also generate results for words that are part of the same word family. For example, searching for "circular econom*" will find phrases like "circular economy" but also "circular economic", or searching for "circular strateg*" will find phrases like "circular strategy" or "circular strategies".

Our analysis focused on scientific research from the last decade. Also, we excluded articles from 2025, limiting our horizon to 2024, the last completed year for publications. Then, in the second step of generating the dataset, we applied a series of refinements based on different criteria. We limited the document types to "Article" and "Proceeding Paper" categories, excluding categories like reviews, books, book chapters etc. Then, we restricted our search to articles that were published in English. Regarding the research category, after analyzing the relevance of documents from various categories, we decided to keep all categories in our analysis. This was expected since the analyzed theme has a multidisciplinary character, and the research is not limited to a certain direction. After applying all the refinement criteria, a dataset of 9,912 articles resulted. Our analysis was facilitated using VOSviewer (version 1.6.20), a specialized software for carrying out a bibliometric investigation.

4. Results and discussions

To achieve the objectives and provide answers to the proposed research questions, we conducted a series of analyses of the articles that made up our selection, the results being presented in the following.

In the first part of our analysis, we aimed to see what the interest is in investigating the topic of circular economy in the context of achieving sustainable development (RQ1). In this sense, Figure 1 presents the evolution of the number of publications from our dataset, written on this topic, from the last decade. A significant increase in annual productivity is noted in terms of articles published on the analyzed topic. Therefore, from 52 papers published in 2015, in 2024, the fabulous number of 2,493 articles was reached. Seeing this annual evolution of publications, it becomes obvious that the circular economy subject is of great interest, and its contribution to sustainable development is being explored from all aspects.

The increased research interest in this field is due to the complexity of the concept as well as the fact that circular economy has become the subject of the main policies supported by important international actors like China, since 2008, through Circular Economy Promotion Law (President of the People's Republic of China, 2008) but also the European Union, since 2015, through The Action Plan for the Circular Economy (European Commission, 2015).

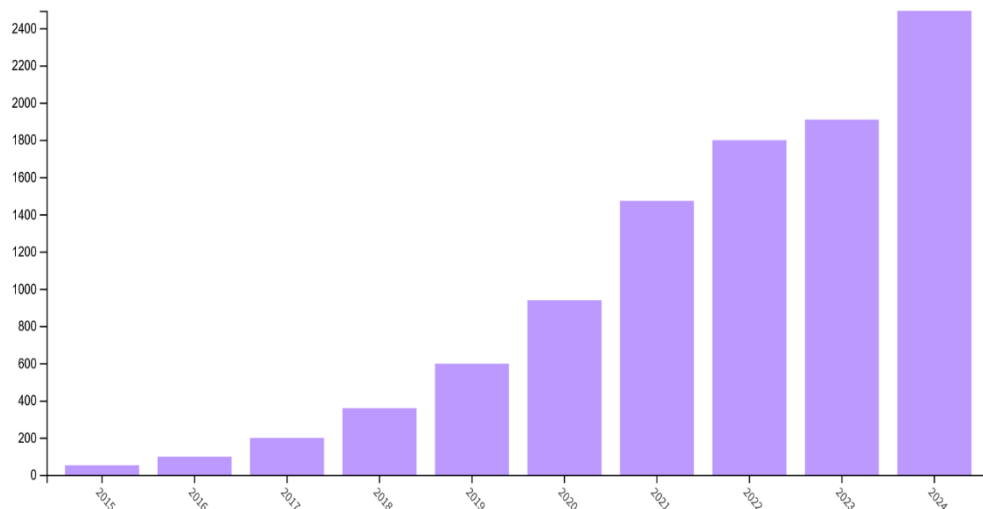


Figure 1: The evolution of the yearly output of publications on the topic of the link between the circular economy and achieving sustainable development
Source: retrieved from Web of Science

The distribution of the articles in the dataset by research areas reveals that most belong to Environmental Sciences Ecology (4,652 records representing 46.933% of the total records), Science Technology Other Topics (3,487 records representing 35.180% of the total records), Engineering (3,108 records representing 31.356% of the total records), Business Economics (1,527 records representing 15.406% of the total records), and Energy Fuels (578 records representing 5.831% of the total records).

A more detailed distribution of the number of articles in the dataset by research areas, containing the first 20 records, can be viewed in Figure 2.



Figure 2: The distribution of the number of articles according to research areas
Source: retrieved from Web of Science

The analysis continued with identifying countries that are the most productive and impactful in the scientific research of the topic addressed in this study (RQ2). The countries that published the highest number of papers regarding circular economy in the context of achieving sustainable development are Italy (1390 documents representing 14.023% of the total records), China (1093 documents representing 11.027% of the total records), England (966 documents representing 9.746% of the total records), Spain (933 documents representing 9.413% of the total records), and India (775 documents representing 7.819% of the total records).

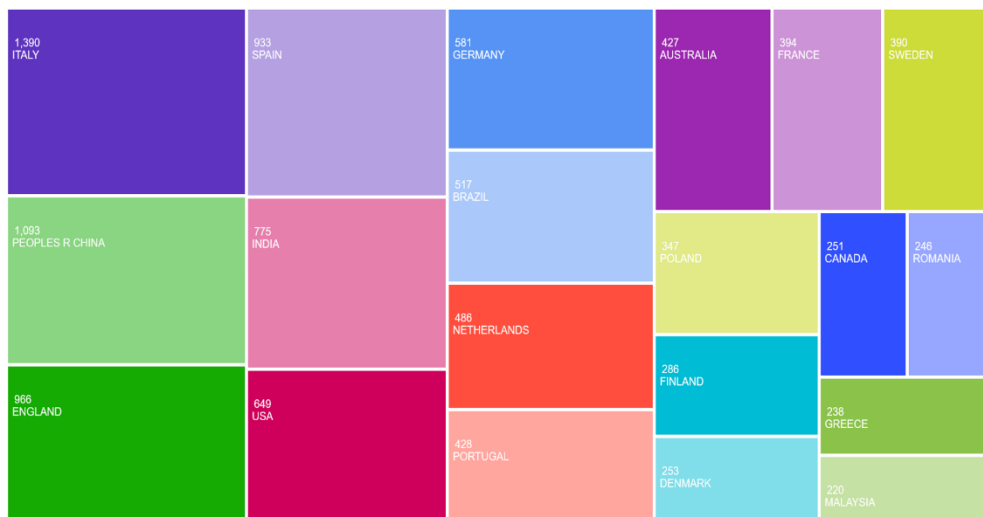


Figure 3: The productivity of countries based on the number of publications
Source: retrieved from Web of Science

The importance of countries, based on the impact of the publications, is measured according to the number of citations. Our analysis reveals that documents from England are the most cited (41,331 citations), followed by Italy (30,213 citations), China (27,081 citations), the Netherlands (20,603 citations), and the USA (19,153 citations).

Table 1: The number of citations by country

Country	Number of citations	Documents
England	41331	966
Italy	30213	1390
China	27081	1093
Netherlands	20603	486
USA	19153	649
Spain	18556	933
India	17867	775
Sweden	15956	390
Germany	15040	581
Finland	13691	286

Source: Authors 'processing

Furthermore, our analysis focused on identifying the most influential journals, taking into account their scientific productivity and impact on the analyzed topic (RQ3). Most of the papers were published in the Sustainability journal, followed by the Journal of Cleaner Production and the Business Strategy and the Environment journal, as shown in Figure 4.

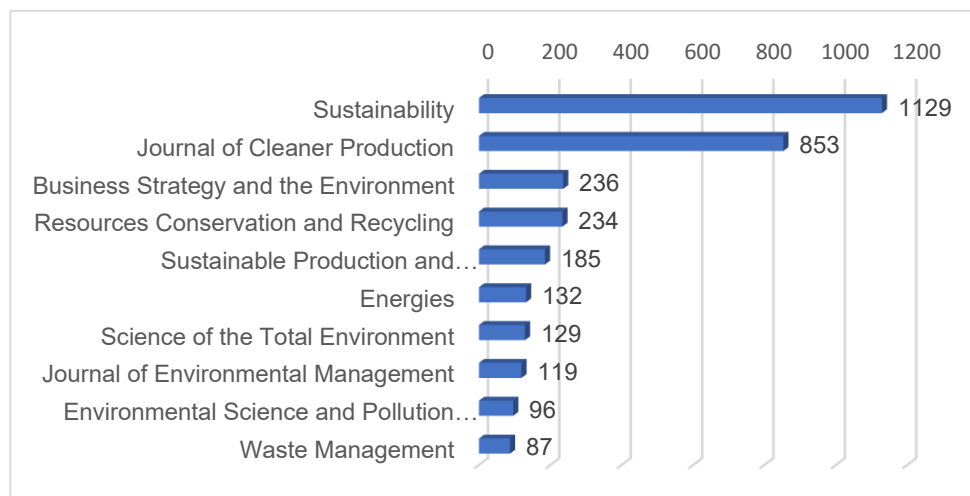


Figure 4: Top 10 journals by the number of published papers

Source: Authors 'processing

A journal's impact is measured by the total number of citations of the papers published in that journal. Table 2 presents the first 10 journals that are the most influential considering this criterion.

Table 2: Top 10 most influential journals

Rank	Journal	Total number of citations
1	Journal of Cleaner Production	40208
2	Sustainability	18137
3	Resources Conservation and Recycling	14618
4	Business Strategy and the Environment	9998
5	Sustainable Production and Consumption	5520
6	Ecological Economics	5316
7	Science of the Total Environment	4825
8	Journal of Industrial Ecology	3974
9	Journal of Environmental Management	3154
10	Waste Management	3006

Source: Authors 'processing

One important aspect that we wanted to know is the ranking of the first 10 most cited articles in our dataset (RQ4). Table 3 lists the hierarchy of the papers with the greatest impact, considering the total number of citations.

Table 3: The first 10 most cited papers

Title	Author(s), publication year	Journal	Total citations
Circular Economy: The Concept and its Limitations	Korhonen, J.; Honkasalo, A.; Seppälä, J. (2018)	Ecological Economics	1833
Product design and business model strategies for a circular economy	Bocken, N.M.P.; de Pauw, I.; Bakker, C.; van der Grinten, B. (2016)	Journal of Industrial and Production Engineering	1778
The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context	Murray, A.; Skene, K.; Haynes, K. (2017)	Journal of Business Ethics	1499
The E factor 25 years on: the rise of green chemistry and sustainability	Sheldon, R.A. (2017)	Green Chemistry	967
Barriers to the Circular Economy: Evidence From the European Union (EU)	Kirchherr, J.; Piscicelli, L.; Bour, R.; Kostense-Smit, E.; Muller, J.; Huibrechtse-Truijens, A.; Hekkert, M. (2018)	Ecological Economics	907

Title	Author(s), publication year	Journal	Total citations
Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications	Genovese, A.; Acquaye, A.A.; Figueroa, A.; Koh, S.C.L. (2017)	Omega-International Journal of Management Science	859
The Relevance of Circular Economy Practices to the Sustainable Development Goals	Schroeder, P.; Anggraeni, K.; Weber, U. (2019)	Journal of Industrial Ecology	804
Circular economy as an essentially contested concept	Korhonen, J.; Nuur, C.; Feldmann, A.; Birkie, S.E. (2018)	Journal of Cleaner Production	792
Metrics of Green Chemistry and Sustainability: Past, Present, and Future	Sheldon, R.A. (2018)	Acs Sustainable Chemistry & Engineering	789
Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers	Kouhizadeh, M.; Saberi, S.; Sarkis, J. (2021)	International Journal of Production Economics	659

Source: Authors 'processing

Figure 5 presents a layout of papers that received the most citations from the dataset identified according to the first author's name and publication year.

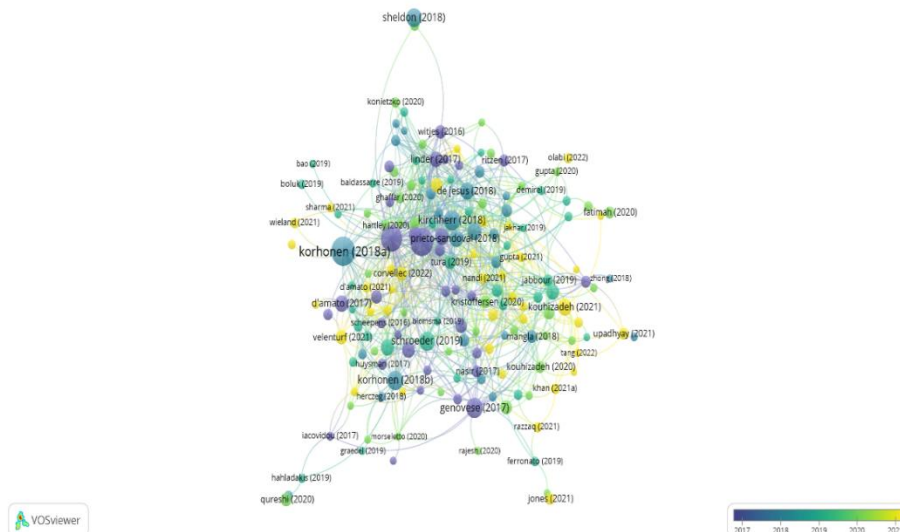


Figure 5: The most cited papers identified according to the first author's name and publication year

Source: Authors 'processing

Collaborative activities are crucial for enhancing research, facilitating the exchange of academic knowledge, and promoting the effective dissemination of research results. In our study, we aimed to illustrate the network map of co-authorship collaborations between countries in publishing research on the topic of the contribution of circular economy to sustainable development (RQ5). We set a minimum of 20 documents and 100 citations per country, and from 148 countries, 75 met the thresholds. The size of the dot indicates the country's contribution and relevance in publishing research papers on the topic analyzed in this study. The thickness of the line and the distance between dots indicate the level of collaboration between authors from different countries. Countries are grouped into 7 clusters, indicating closer collaborative communities. England, China, Italy, the USA, Spain, India, and Germany have engaged the most in international collaborations.

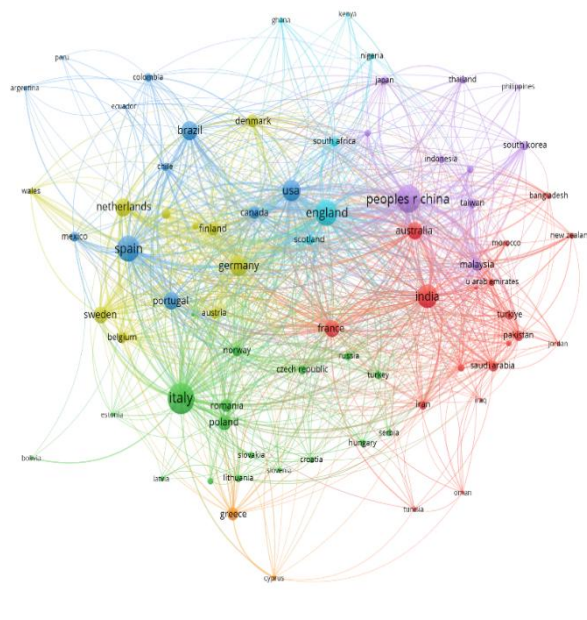
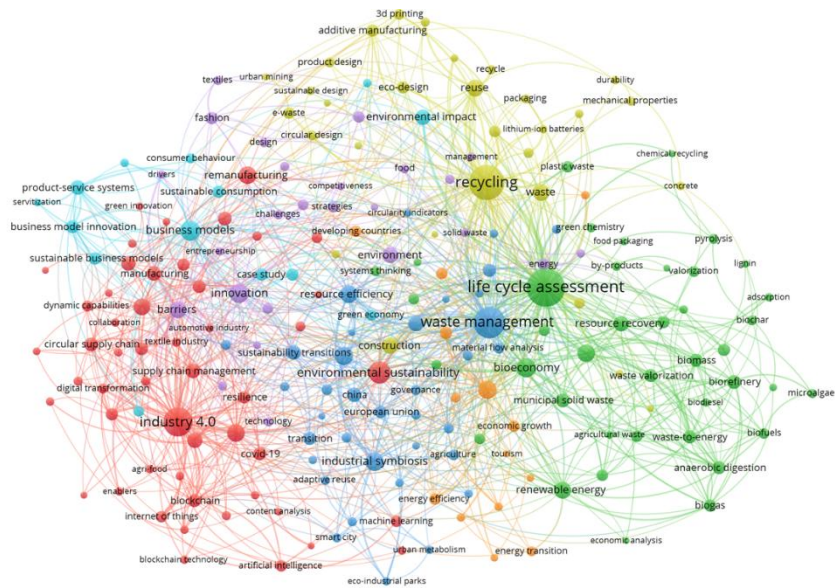


Figure 6: Country co-authorship network map
Source: Authors 'processing

To provide an answer to RQ6, we have conducted a keyword co-occurrence analysis that identified the relevant thematic clusters. Each keyword included in this network is represented by a node, its size indicating the frequency of occurrence and, implicitly, its relevance within the dataset. The connection (link) between nodes signifies the co-occurrence of keywords, indicating that they appear together. A thicker link between nodes indicates a higher frequency of keyword co-occurrences, and a shorter link indicates a stronger relationship between the connected keywords. We performed this analysis based on the keywords that were mentioned by the authors. We set a minimum of 20 occurrences per keyword.

We excluded generic keywords related to circular economy or sustainable development, as they appear in all papers. Also, for a better co-word network representation and analysis, we created and used a thesaurus file through which we unified the terms that refer to the same concept. Therefore, we eliminated redundancies, grouping terms that appeared written in multiple forms, which allowed for a clearer visualization of the keyword network. The co-occurrence analysis was performed on a total of 210 keywords from a total of 20,587.



 VOSviewer

Figure 7: Network visualization of author keywords co-occurrence
Source: Authors 'processing

Consequently, the map revealed 7 clusters of keywords with a total of 3945 links and with 7118 total link strengths. Cluster 1 (red), the largest, comprises 51 items and is centered around the concepts of industry 4.0 (320 occurrences), environmental sustainability (182 occurrences), supply chains (122 occurrences), remanufacturing (115 occurrences), small and medium sized enterprises (104 occurrences), digitalization (93 occurrences), manufacturing (81 occurrences), supply chain management (79 occurrences), corporate social responsibility (77 occurrences), reverse logistics (72 occurrences), blockchain (67 occurrences), eco-innovation (67 occurrences), closed-loop supply chain (66 occurrences), digital technologies (58 occurrences). These concepts in the first cluster highlight the strong connection between integrating new technologies into supply chain management, as a central element of the circular economy implementation in an attempt to achieve sustainable development. Cluster 2 (green) is formed by 40 items, of which the most relevant ones are life cycle assessment (548 occurrences), bioeconomy (141 occurrences), food waste (114 occurrences), renewable energy (111 occurrences), resource recovery (89 occurrences), municipal solid waste (71 occurrences), biorefinery (69 occurrences).

biomass (68 occurrences), waste-to-energy (68 occurrences), waste valorization (64 occurrences). These themes point out the side of the circular economy in relation to the environmental dimension of sustainability, the need to rethink the life cycle of products, underlining circularity as the basic principle, and the importance of waste management as one of the main instruments used.

Cluster 3 (blue) includes 36 items and is centered around the core concepts of waste management (365 occurrences), industrial ecology (131 occurrences), industrial symbiosis (131 occurrences), resource efficiency (119 occurrences), indicators (89 occurrences), and sustainability transitions (83 occurrences). This cluster reveals the need for companies to rethink technological processes on a circular basis, targeting resource inputs and goods outputs that allow the creation of closed loops and the use of secondary raw materials in the manufacturing process.

Cluster 4 (yellow) comprises 30 items, the central core concepts being recycling (456 occurrences), waste (108 occurrences), reuse (106 occurrences), and construction (96 occurrences). These core concepts focus mainly on the principles of the 3Rs, strongly associated with circular economy and sustainable development, highlighting the role of recycling, reuse, repair, reconditioning, and remanufacturing.

Cluster 5 (purple), with 25 items, is formed around the central core concepts of innovation (134 occurrences), barriers (111 occurrences), and environment (102 occurrences), suggesting the importance of innovation for the transition to circular economy, but also the fact that, sometimes, there are barriers to overcome, considering the costs and the access to new technologies.

Cluster 6 (light blue) includes 14 items, of which the most important ones are business models (155 occurrences), environmental impact (86 occurrences), product-service systems (78 occurrences), and business model innovation (66 occurrences), sustainable consumption (61 occurrences), sustainable business models (58 occurrences), and sustainable production (56 occurrences). These core concepts reveal the importance of redefining the business models, rethinking technological production processes, and reshaping consumer behaviour, for fostering the implementation of circular economy and ensuring sustainable development.

Cluster 7 (orange) includes 14 items, the central ones being climate change (128 occurrences), carbon emissions (57 occurrences), economic growth (54 occurrences), energy efficiency (54 occurrences), and carbon footprint (52 occurrences). This cluster focuses on the environmental problems and also highlights the issue of separating economic growth from primary resource consumption, one of the main objectives of the circular economy.

5. Conclusions

The circular economy, as a possible solution to current global problems, is inspired by natural regenerative cycles, and consequently, its main goal is to minimize resource consumption and waste generation and reduce the impact on the environment. To this end, the principles of the circular economy focus mainly on closing the loops, rethinking the life cycle of products, as well as resource management, supply chain management, and waste management.

The concept has gained considerable momentum in academic research, including links to sustainability and sustainable development. The principles of the concept are increasingly used by the economic environment and communities, especially in the European Union and China, the main promoters of this vision of the economy.

As Lakatos et al. (2021) suggested, creating a system based on the circular economy, involves all economic actors: business, consumers, and authorities, but it can also be included here the contribution of the academic research to clarify concepts in this field, generate innovations, create new technologies and help the implementation of the circularity.

Our study conducted a bibliometric analysis targeting the most relevant publications in the Web of Science database on the circular economy-sustainable development topic. We have analyzed the scientific output of research in the chosen field to reveal the interest and impact of circular economy-related scientific research, as well as the concepts and themes that were the most researched in the field.

The topic of the circular economy is certainly one of the main research topics at a global level, analyzed in the broader context of the idea of sustainable development. The past ten years have witnessed a worldwide consistent increase in the interest shown toward publishing research related to the circular economy. Our analysis highlighted the interdisciplinary nature of this concept and of the research related to it. However, most of the papers are published in research areas like Environmental Sciences Ecology, Science Technology, Engineering, Business Economics, and Energy Fuels. Countries like Italy, China, and England hold the supremacy for the number of papers published and total number of citations, highlighting their important role in research and advancements of the analyzed topic. Researchers from these countries are also heavily engaged in international collaborations with authors from other countries. A few journals dominate regarding the number of publications on this topic and the citations of publications, namely the Sustainability journal, the Journal of Cleaner Production, Business Strategy and the Environment journal, and the Resources Conservation and Recycling journal. An important objective of our analysis was to identify key concepts, which revealed that research revolves around the themes of life cycle assessment, recycling, waste management, industry 4.0, environmental sustainability, business models, bioeconomy, innovation, industrial ecology, industrial symbiosis, climate change, and supply chains.

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A BIBLIOMETRIC ANALYSIS ON THE LINK BETWEEN GREEN INNOVATIONS AND CIRCULAR ECONOMY

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Abstract: *This study conducts a comprehensive bibliometric analysis to examine the complex interconnections among green innovations and circular economy - key concepts in advancing sustainable development. Given today's pressing environmental challenges, the circular economy has become one of the European Union's most significant policy priorities. In this context, growing attention is being directed toward identifying key pathways for facilitating the transition to this new economic model, with green innovations, or eco-innovations, playing a particularly prominent role. This paper explores the key aspects of the relationship between these concepts by presenting an analysis of the relevant research in this field. The analysis brings to the forefront an increasing interest in studying the link between the concepts and highlights research areas like Environmental Sciences Ecology, Business Economics, Science Technology Other Topics, Engineering, and Public Administration. Furthermore, the growing importance of cross-border collaborations in promoting green technologies and policies is highlighted, along with revealing the leading countries in terms of publication numbers regarding the link between green innovations and circular economy, i.e., Italy, Spain, England, and China, among which the most cited are those from England. As for the journals, the following stand out: the Journal of Cleaner Production, Sustainability, Ecological Economics, and the Business Strategy and the Environment journal. The concepts underlying the research that connects green innovations with the circular economy are often found alongside themes such as sustainability, innovation, sustainable development, small and medium-sized enterprises, barriers, recycling, climate change, business models, industrial ecology, eco-design, and corporate social responsibility.*

Keywords: *green innovations; eco-innovations; environmental innovations; sustainable innovations; circular economy; bibliometric analysis.*

JEL Classification: O31; Q01; Q55

1. Introduction

In recent decades, humanity has faced many environmental problems, especially climate change, including growing pollution, biodiversity loss, and depletion of limited

resources (Karlilar, Balcilar and Emir, 2023). In the United Nations Climate Change Conference in 2015, the participating nations signed the Paris Agreement (2016) in an attempt to limit the global temperature's increase to below 2°C above the pre-industrial level. In this context, Agrawal et al. (2024) highlight the growing interest regarding climate change, global warming, pollution, and other environmental problems from governments and regulators. Concepts such as green innovations and circular economy represent hot topics for research. This paper aims to conduct an in-depth analysis of the relationship between green innovations and the circular economy, as well as their necessity in the current economic context regarding the transition to a green economy, to facilitate the achievement of the European Green Deal objectives. In academic literature, the terms green innovations, ecological innovations, environmental innovations, and sustainable innovations are frequently used interchangeably by many authors, given that the differences between them are minimal. Consequently, we will refer to them as synonyms. Resource efficiency-oriented eco-innovation (green innovation) adoption is considered a key pillar for the European Union strategy regarding the transition to a circular economy (Cainelli, D'Amato and Mazzanti, 2020), all this in an attempt to achieve sustainable, balanced, and inclusive economic growth (Karlilar, Balcilar and Emir, 2023).

2. Theoretical background

In their research, Cobbinah, Osei and Amoah (2025) highlight the urgent need to focus on setting sustainable development goals and implementing them through processes and technologies grounded in green innovation. This necessity arises from the ongoing ecological, climatic, and environmental challenges we are currently facing, and the escalating research output in these domains underscores a growing recognition of their pivotal role in fostering sustainable development and mitigating environmental degradation (Bhardwaj et al., 2020). Eco-innovation can be conceptualized as a threefold approach, encompassing technological, social, and institutional dimensions (Hellstrom, 2007), necessitating a comprehensive reconstruction to align with principles of nature (Hofstra and Huisingh, 2013), which challenges firms to engage in continuous adaptation to a dynamic environment (Salim, Rahman and Wahab, 2018).

Martínez, Inés and Poveda (2021) consider sustainable development goals and the shift toward a green growth as means through which countries can achieve better economic performance with a lower negative impact on the environment, in which an essential role is played by science, technology, and innovation.

Green innovation is viewed and defined as the result of implementing ideas and knowledge from the economic field aimed at generating profit in a way that is as environmentally friendly as possible (Takalo, Tooranloo and Shahabaldini parizi, 2021), and it is increasingly being adopted by producers in pursuit of sustainable development, generating a lower cost of energy due to these green-manufacturing technologies (Kong et al., 2016). In a study conducted on OECD nations, Karlilar Balcilar and Emir (2023) highlight the crucial role of green innovation in reducing resource waste, as well as promoting greener and more energy-efficient technologies to be used in production, and so, to contribute to environmental sustainability. At the same time, Xie, Huo and Zou (2019) are talking about two types of green innovations, namely green process

innovations and green product innovations, the former with a positive impact on the latter and both with a significant impact on the financial performance of companies. Ecological innovation has a positive and significant impact on energy efficiency, thereby confirming its essential contribution to the green transition in Europe (Chatzistamoulou and Koundouri, 2024). In the authors' opinion, this aligns with European policy directives and recent scholarly literature, which emphasize the role of eco-innovation in promoting sustainability.

In an era defined by rapidly evolving green technologies and compressed product lifecycles (Tseng et al., 2012), this multifaceted concept extends beyond mere technological advancements; it encompasses organizational, marketing, and systemic changes that contribute to a more sustainable trajectory (Boons et al., 2012). Zarthia et al. (2024) highlights the importance of eco-innovations or green innovations for the environment and for introducing economic models based on the circular economy. Agrawal et al. (2024) also make the connection between the circular economy and green innovations as well as green financing, arguing that green innovations fit into a circular society. The circular economy is regarded as an essential approach to achieve a more sustainable economic paradigm (De Jesus and Mendonça, 2018). Based on a literature review and a study conducted on several small and medium-sized companies, Bag et al. (2022) conclude that there is a clear link between eco-innovations, green supply chain management, and the circular economy, in the sense that the first two contribute to the implementation of the third. Cainelli, D'Amato and Mazzanti (2020) show the dependence of circular economy adoption with the help of various environmental innovations on the policy platform, more specifically, the European Union policy regarding waste management that has emerged over time, the latest regarding the launch of the circular economy strategy in 2015, with subsequent updates. On the other hand, Le, Ferraris and Dhar (2023) claim that circular economy practices encourage eco-innovation in order to increase resource efficiency and environmental performance. We can conclude that between eco-innovations and circular economy is a two-way reciprocal influence relationship. We agree with De Jesus and Mendonça (2018), who think that eco-innovation is considered an essential element for overcoming the barriers that stand in the way of achieving the circular economy. The dividing line between different concepts, such as circular economy, green economy, and bioeconomy, is quite blurred; these concepts are often based on common principles, but there are also substantial differences.

We can also find criticisms of these concepts, as Karlilar, Balcilar and Emir (2023) argue that green innovation can limit dependence on fossil fuels and at the same time promote alternative renewable energies. However, when it comes to the use of green energy, a negative effect can be observed on energy efficiency, suggesting the presence of a rebound effect that may undermine the benefits gained (Chatzistamoulou and Koundouri, 2024). Despite criticism, the transition to a circular economy, with an essential contribution from eco-innovations, can be a viable solution for a sustainable future.

3. Research methodology

A quantitative technique-based analysis (Donthu et al., 2021), the bibliometric approach used within research allows delving into the literature and uncovering trends, patterns, and implications within a specific domain (Passas, 2024). From a bibliometric perspective, our study aims to analyze the extent to which the link between green innovations and the circular economy has been researched in the specialized literature. To meet this objective, the study seeks to answer the following questions:

RQ1. What is the interest in investigating the link between green innovations and the circular economy?

RQ2. What countries have published the most and received the most citations for publications analyzing green innovations in the context of the circular economy?

RQ3. Which are the journals with the most published papers and the most citations of articles analyzing the link between green innovations and the circular economy?

RQ4. What are the most highly cited publications on the topic under investigation?

RQ5. Which countries are collaborating internationally on research focused on the link between green innovations and the circular economy?

RQ6. Which concepts and themes are most prominent in research on the link between green innovations and circular economy?

Accordingly, the Web of Science database was explored to support the fulfillment of our study's objectives. The search process was performed on April 22, 2025. The initial step in generating the dataset involved conducting a database search based on topic criteria, which in the case of Web of Science includes searching for terms in the title, abstract, author keywords, and keyword plus. In the literature, green innovations, ecological innovations, environmental innovations, and sustainable innovations are terms used interchangeably by many authors since the differences are only subtle. Therefore, our search included all these terms to obtain the most relevant results. The search was performed using the following algorithm:

("green innovati*" OR "eco-innovati*" OR "ecoinnovati*" OR "ecological innovati*" OR "environmental innovati*" OR "sustainable innovati*") AND ("circular econom*" OR "circularity" OR "circular strateg*" OR "circular* principles" OR "circular business*")

To retrieve results for different variations of words, we utilized the "*" symbol. In this way, searching for "green innovati*" will generate results like "green innovation", but also "green innovations", or "green innovative".

Our analysis targeted scientific research published until 2024, the most recent full year of available publications. In the second phase of dataset generation, we applied several refinements based on specific criteria. We focused on the "Article" and "Proceeding Paper" document types, excluding other categories such as reviews, books, and book chapters. Additionally, we limited our search to articles published in English. We chose to include all the research categories in our analysis. This decision aligns with the multidisciplinary nature of the topic. Following the application of the refinement criteria, the dataset contained 538 documents. In our analysis, we used VOSviewer, version

1.6.20, which is a software that allows for pursuing a bibliometric investigation of the chosen topic.

4. Results and discussions

In order to meet the objectives and address the proposed research questions, we carried out a series of investigations on the selected articles, with the results presented below. In the initial phase of our analysis, we sought to assess the level of interest in exploring the relationship between green innovations and the circular economy (RQ1). Accordingly, Figure 1 illustrates the evolution of the number of publications in our dataset addressing this topic, spanning from 2008, the year of the first recorded entry in the database, to 2024. It can be seen that the interest in researching this topic exists and that the role of green innovations in supporting the circular economy is increasingly being explored. Starting in 2016, the number of studies on this subject has risen steadily each year, reaching a total of 122 publications by 2024. The growing interest in this topic is likely driven primarily by the European Union's adoption of the transition to a circular economy as a core policy, following China's earlier implementation of a similar approach.

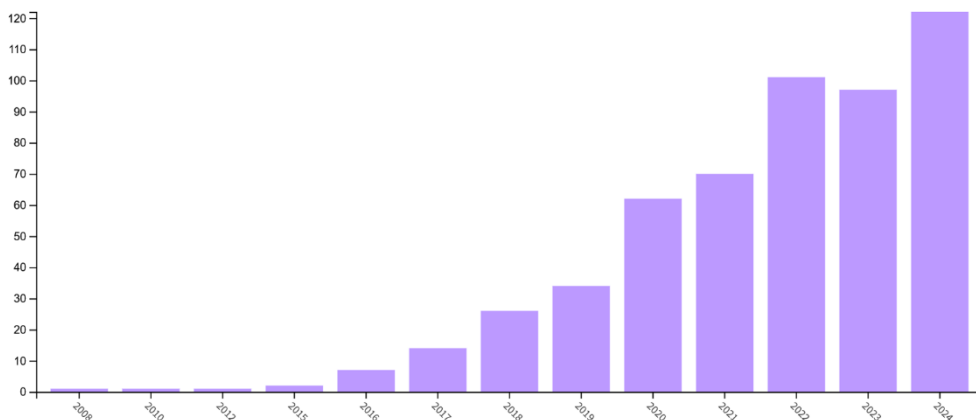


Figure 1: The annual progression of publication output regarding the role of green innovations in supporting the circular economy

Source: retrieved from Web of Science

Looking at the research area distribution, it can be observed that the majority of papers fall within the field of Environmental Sciences Ecology (284 records representing 52.788% of the total records), Business Economics (196 records representing 36.431% of the total records), Science Technology Other Topics (195 records representing 36.245% of the total records), Engineering (124 records representing 23.048% of the total records), and Public Administration (28 records representing 5.204% of the total records).

Figure 2 presents a more detailed breakdown of the number of papers by research area, highlighting the top 10 categories.



Figure 2: The distribution of articles across various research areas
Source: retrieved from Web of Science

Research Question 2 seeks to identify the countries that are most productive and influential in the scientific research related to the role of green innovations in supporting the circular economy. Countries with the highest publication output are Italy (83 documents representing 15.428% of the total records), Spain (82 documents representing 15.242% of the total records), England (73 documents representing 13.569% of the total records), China (67 documents representing 12.454% of the total records), and India (39 documents representing 7.249% of the total records).

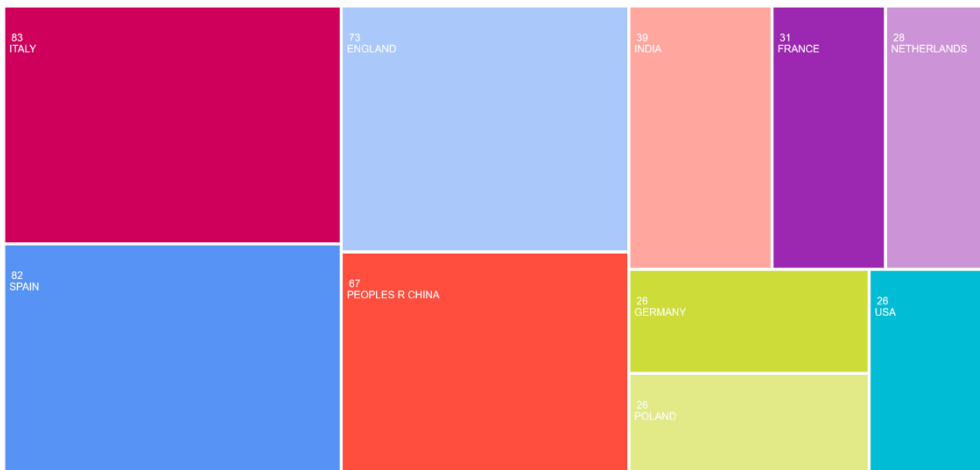


Figure 3: Countries with the highest publication output
Source: retrieved from Web of Science

Based on the number of citations received by publications from each country, our study reveals that the countries with the most impactful papers are England (4,256 citations),

followed by the Netherlands (3,591 citations), Spain (2,949 citations), Italy (1,936 citations), and Germany (1,742 citations).

Table 1: Citations count by country

Country	Number of citations	Documents
England	4256	73
Netherlands	3591	28
Spain	2949	82
Italy	1936	83
Germany	1742	26
China	1725	67
India	1211	39
Sweden	1148	23
France	907	31
Portugal	854	16

Source: Authors 'processing

As for the journals, we aimed to identify the most influential ones (RQ3). In this sense, we focused our analysis on considering both the scientific productivity of journals and their impact in the view of the topic under investigation. The figure below shows that the highest number of papers were published in the Sustainability journal (66 documents), the Journal of Cleaner Production (63 documents), and the Business Strategy and the Environment journal (35 documents).

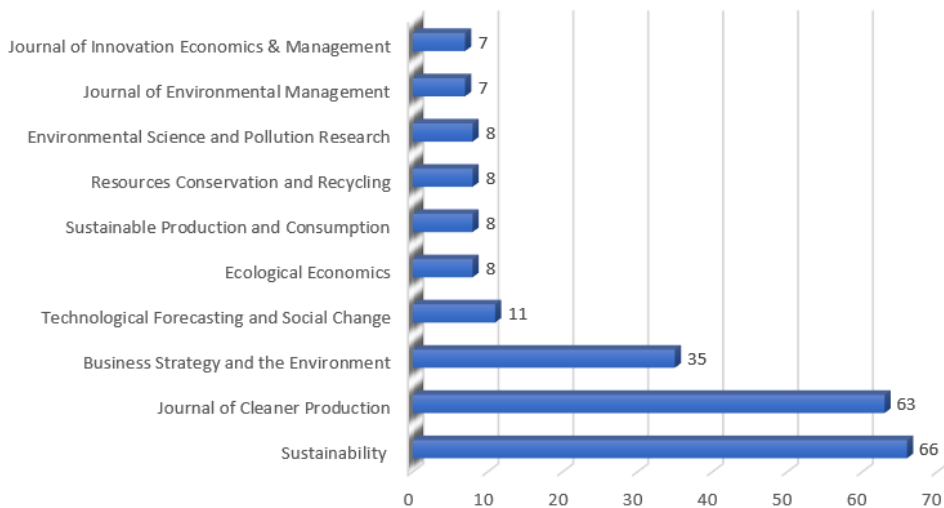


Figure 4: The leading ten journals by publication volume

Source: Authors 'processing

A journal's influence and relevance on a certain topic are commonly assessed through the total citations received by its publications. In Figure 5, we have included the first ten

journals whose publications on the analyzed topic received the highest number of citations.



Figure 5: The leading ten journals ranked by the citation count of their publications
Source: Authors 'processing

A relevant aspect we sought to explore, in line with Research Question 4, was the top 5 most cited articles within our dataset. Table 2 below presents the hierarchy of these high-impact papers, based on their total citation counts.

Table 2: The five articles with the highest citation count

Title	Author(s), publication year	Journal	Citations
Barriers to the Circular Economy: Evidence from the European Union (EU)	Kirchherr, J.; Piscicelli, L.; Bour, R.; Kostense-Smit, E.; Muller, J.; Huibrechtse-Truijens, A.; Hekkert, M. (2018)	Ecological Economics	913
Lost in Transition? Drivers and Barriers in the Eco-innovation Road to the Circular Economy	de Jesus, A.; Mendonça, S. (2018)	Ecological Economics	630
Implementation of Circular Economy Business Models by Small and Medium-Sized Enterprises (SMEs): Barriers and Enablers	Rizos, V.; Behrens, A.; van der Gaast, W.; Hofman, E.; Ioannou, A.; Kafyeke, T.; Flamos, A.; Rinaldi,	Sustainability	629

Title	Author(s), publication year	Journal	Citations
	R.; Papadelis, S.; Hirschnitz-Garbers, M.; Topi, C. (2016)		
Towards a consensus on the circular economy	Prieto-Sandoval, V.; Jaca, C.; Ormazabal, M. (2018)	Journal of Cleaner Production	619
Circular Economy in the building sector: Three cases and a collaboration tool	Leising, E.; Quist, J.; Bocken, N. (2018)	Journal of Cleaner Production	301

Source: Authors 'processing

The most frequently cited articles, along with their first authors and publication years, are illustrated in Figure 6.

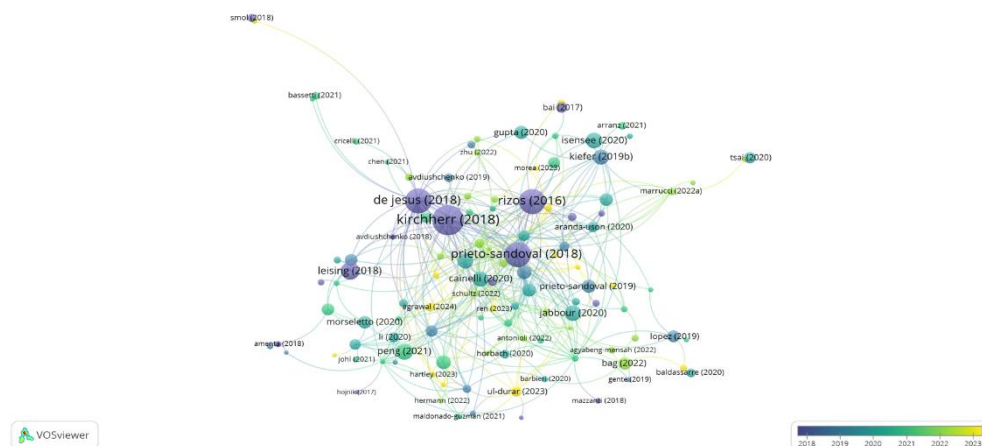


Figure 6: Highly cited articles, as determined by first author and publication year
Source: Authors 'processing

Further in this study, in line with Research Question 5, we proposed to reveal the co-authorship network map between countries involved in publishing research on the link between green innovations and circular economy, as collaborative activities play a vital role in advancing research. A minimum threshold of five documents was established, and out of 85 countries, 40 met this criterion. The countries are organized into eight clusters, representing closely connected collaborative communities. Among them, England, Spain, Italy, and China stand out as the most actively involved in international research collaborations.

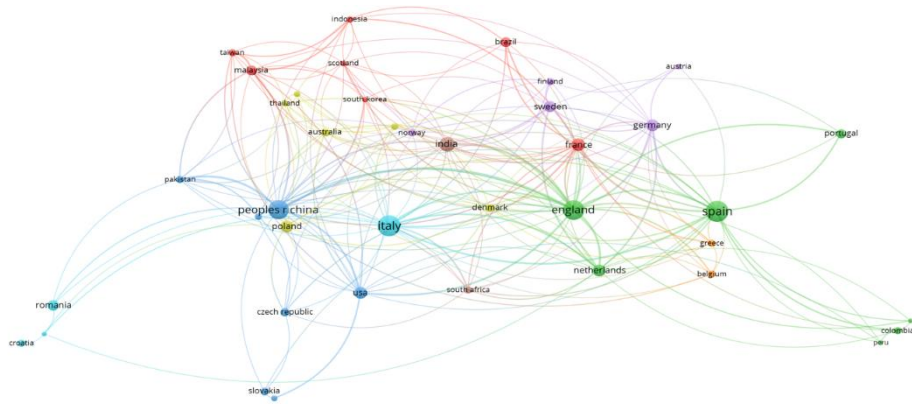


Figure 7: Cross-country research collaboration network
Source: Authors 'processing

To address Research Question 6, we performed a keyword co-occurrence analysis that revealed the main thematic clusters. In this network, each keyword is represented as a node, with its size reflecting how frequently it appears and, by extension, its importance within the dataset. This analysis was conducted using the keywords provided by the authors, with a threshold of at least five occurrences per keyword. The links between nodes represent keyword co-occurrences, indicating that the connected terms frequently appear together. Thicker links denote a higher frequency of co-occurrence, while shorter links suggest a stronger association between the keywords.

We have eliminated generic keywords related to green innovations and their synonyms, and circular economy concepts, as these were present across all papers and did not contribute to distinguishing thematic clusters. Additionally, to enhance the clarity and accuracy of the co-word network analysis, we developed and applied a thesaurus file to standardize terminology. This process involved consolidating terms that referred to the same concept but appeared in different forms, thereby reducing redundancy and enabling a more coherent visualization of the keyword network. The co-occurrence analysis was conducted on a selection of 45 keywords, drawn from a total of 1,613.

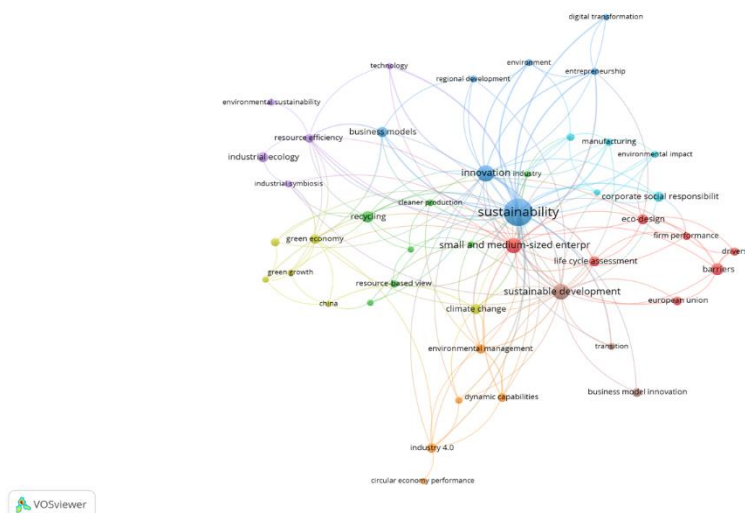


Figure 8: Author keywords co-occurrence network
Source: Authors 'processing

As a result, the map showed 8 clusters of keywords, encompassing 154 links and an overall link strength of 221. Cluster 1, with red color, is centered around the concepts of small and medium-sized enterprises, barriers, life cycle assessment, and eco-design. This cluster brings together concepts that point out both the influencing factors and the barriers that businesses face while attempting to align their products to meet the requirements of environmentally friendly economies, such as the circular economy and the green economy.

Cluster 2, with green color, contains the core concepts: recycling, resource-based view, and cleaner production. This points out the circularity as a new paradigm in carrying out economic activities by reintroducing materials into the economic circuit.

In cluster 3, with blue color, the relevant concepts are sustainability, innovation, and business models. This supports the idea that innovation is the driving force to develop entrepreneurship and create economic models in line with sustainable development.

Cluster 4, marked with yellow color, is dominated by concepts like climate change, green economy, and waste management. These topics indicate the concern about climate issues and the solutions needed to address them, also highlighting the role of waste management as a central instrument in both the green economy and the circular economy.

In cluster 5, represented with purple color, the core concepts included are industrial ecology, resource efficiency, environmental sustainability, and industrial symbiosis. This cluster brings together the main concepts related to an environmentally friendly economy, based on new technologies, for minimizing the use of resources, optimizing resource flows, waste reduction, and symbiotic industrial practices.

Cluster 6, marked with a light blue color, is centered around core concepts like corporate social responsibility, sustainability performance, manufacturing, and environmental impact. This cluster addresses the environmental dimension, as well as the social

dimension of sustainability, as regards the social responsibility of companies in trying to achieve cleaner manufacturing activities.

In cluster 7, represented with orange color, the central concepts are Industry 4.0, environmental management, and dynamic capabilities. These topics address the idea of a cleaner environment achieved through the latest technologies to support the transition to an efficient economy based on the principles of circularity.

Finally, cluster 8, represented with the brown color, includes concepts like sustainable development, business model innovation, and transition. This indicates the need to change the way business is done in order to achieve sustainable development with the contribution of innovation.

5. Conclusions

Green innovations and the circular economy are intrinsically linked concepts that collectively drive sustainable development by fostering resource efficiency, waste reduction, and environmental protection while simultaneously promoting economic growth (Xie, Huo and Zou, 2019). As Cainelli, D'Amato and Mazzanti (2020) stated, eco-innovation adoption is a key element in the transition to a circular economy, and by extension, in an attempt to achieve sustainable development, because a circular economy is considered to be essential for achieving a more sustainable economy (De Jesus and Mendonça, 2018).

In this paper, we carried out a bibliometric analysis focused on the publications with the highest relevancy from the Web of Science database that explore the relationship between green innovations and the circular economy. Our analysis of the scientific research related to the chosen topic had the objective of emphasizing the interest towards this topic, as well as identifying the most frequently explored concepts and themes.

Given the growing scholarly interest in the circular economy, this study seeks to assess the extent to which green innovations are examined within this framework. This bibliometric analysis reveals several key insights into the interconnected fields of green innovations and the circular economy, highlighting, at a global level, both the progress made in research and academic publishing on these topics and the international collaborations that contribute to the development of this multidisciplinary field.

We can observe that research addressing the subject of green innovations in the context of the circular economy exists, is increasingly numerous, and is carried out in different areas, many of them being included in research areas like Environmental Sciences Ecology, Business Economics, Science Technology Other Topics, Engineering, and Public Administration. Countries such as Italy, Spain, England, and China lead in terms of the number of published papers that analyze together the green innovations and circular economy topic. Researchers from these countries also stand out as being the most actively involved in international research collaborations. Our analysis revealed that the most influential journals are the Journal of Cleaner Production, Sustainability, Ecological Economics, and the Business Strategy and the Environment journal. A key objective of our analysis was to uncover the main concepts underlying the research that connects green innovations with the circular economy. In this regard, the analysis performed revealed that there is a focus on themes such as sustainability, innovation, sustainable development, small and medium-sized

enterprises, barriers, recycling, climate change, business models, industrial ecology, eco-design, and corporate social responsibility.

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THE IMPACT OF RESEARCH, DEVELOPMENT AND INNOVATION EXPENDITURES AND EMPLOYMENT ON ECONOMIC GROWTH. A PANEL DATA ANALYSIS THROUGHOUT ROMANIA'S MACRO-REGIONS

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Abstract: *This present study examines the causality between core elements of an economy, namely economic growth, employment levels in R&D sector, and research, development, and innovation (RDI) spending throughout Romania's macro-regions. RDI has a pivotal role when it comes to economic expansion, but its impact depends on several factors, including, but not limited to funding sources and regional disparities. While both public and private sources of investment in the field of RDI contribute to economic development, private funding tends to yield more efficient results, regardless of discussed timeframe, and thus its influence transcends local and regional economies and manages to develop cross-border relationships and dynamics. We have developed a panel data ARDL model for Romania, that reveals the significant impact on long and short run of research, development, and innovation spending on the economic growth as well as a long run impact of hirings in this sector on the economic growth.*

Keywords: *regional development; research and development; economic growth; spending levels.*

JEL Classification: O0; O2; O3; O5.

1. Literature review

Research, development and innovation (RDI) are to be considered as the cornerstone for the development and improvement of economies, regions and societies. Advancements regarding RDI translate into the development of knowledge, the process of satisfying a broader percentage of needs, wants and desires through the form of creating novel products, services and technologies (Solow R. M., 1956), (Szarowská, 2017). Countries and regions that manifest potent ecosystems targeting innovation manage to attract greater investment levels, improved quality of hirings and manage to at least maintain auspicious trade balances (European Commission, 2016; Wensheng, Kong, Shi, Boamah, & Tang, 2022). Apart from impacting regions and societies, companies (SME's and MNC's alike) must understand that the investments

and hirings for RDI purposes will entail improved business survival rates, whilst simultaneously protecting the companies from decreasing their revenue streams, maintain customer levels, and improve working conditions for employees (Cadaru & Bădulescu, 2018). What is more, by comparison of regions, three distinctive elements always seem to arise when analyzing the reasons behind the advancements and the success of various regions, irrespective of size: the quality and productivity of institutions, effectiveness of the industry-academia-government partnership, and lastly, the presence of procedures, regulations and mechanism that promote the transfer of knowledge (Cooke, Gomez Uranga, & Etzebarria, 1997).

Even though there are numerous studies on the impact of RDI spending and RDI related employment upon economic growth, a straightforward consensus has yet to be achieved; even so, one point of consensus shows that even though the funding sources can be both private and public, out of the two, private sources of funding do manage to pose a higher impact and more greatly influence general growth levels (Sehleanu, Simuț, & Simuț, 2022).

The aspect regarding private sources for financing of RDI activities and employment further detail the imbalances that exist between regions, so much so, that it has become apparent and evident for authorities/lawmakers and the general population that investment levels across various regions from public sources are not sufficiently large or targeted. Even so, a somewhat paradoxical situation has arisen in recent years: even though the effect of private financing for RDI activities has better outcomes than public sources for financing less advanced EU regions have in fact attempted to increase their overall public expenditure on R&D; these public expenditures automatically mean higher GDP growth rates, given that technological improvements (one of the purposes of RDI investments) positively impact economic growth (Guadalupi, Tutore, Matricano, & Andreottola, 2013). Even so, differences between factor driven and efficiency driven economies (together with their respective regions) are not able (given the lack of resources) to maintain in the long run such RDI expenditures (Sehleanu, Simuț, & Simuț, 2022). But here again, the channeling or focusing of monetary and policy related efforts (specializing in a certain field or domain and maintaining constant investment levels in those specific areas) proves useful for such factor driven economies in order to diminish the imbalances that exist between countries and regions.

In the field of specialty literature, numerous studies that have been presented throughout the years have aimed to showcase the impact of the RDI spending and employment on economic growth. Given that each innovation cycle that humanity has gone through has a certain particularity, namely that each new cycle will last for a smaller period of time than the previous one (Jovanović, Dlačić, & Okanović, 2018), most of the published articles point out that adaptability is of key importance, regardless of country or of region. Table 1 is intended to highlight relevant studies and models, and their respective impacts on/correlation to economic growth, based on RDI spending and employment.

Table 1 showcases the numerous facets through which employment and spending aimed at RDI are connected with economic growth, but more importantly, this table points towards the existence of bidirectional approach to the type of relationship that exists between RDI related employment and spending, and economic growth (for several regions, instances exist where not only is economic growth the direct results of spending and hirings related to RDI activities, but economies that manage to follow and

upward economic path also manage to do so by welcoming more investments targeted at RDI related activities)(Cooke, Gomez Uranga, & Etxebarria, 1997). Even though the vast majority of economic literature is in favor of the idea that RDI spending and employment have a positive impact on economic growth, there are nonetheless several authors that have brought forth several critiques of these ideas (either through direct criticism of this view, or by challenging the limitations and inefficiency of RDI investment presented by those that consider this idea to hold water). Among the ideas that come as a critique aimed at the impact of RDI investments, one that has managed to gain numerous followers revolves around the notion according to which despite increased investments in innovation, technology (RDI in general terms), oftentimes a certain lag in measuring economic growth presents itself; these particular

Table 5. Key Economic Theories Linking RDI Spending, Employment, and Economic Growth

Economic Model or Theory	General concept of the model or theory	RDI Spending Activity & Its Impact on Economic Growth	RDI-Related Employment & Its Impact on Economic Growth
Endogenous Growth Theory	Knowledge accumulation and innovation are the key drives of long term oriented economic growth.	Increased RDI spending greatly impacts technological progress, and thus in turn it leads to sustained economic growth.	Employment in high-skill, RDI-intensive sectors not only does it enhance productivity, but it also reinforces GDP in the long run (Romer, 1986), (Lucas, 1988).
Schumpeterian Growth Model	The process of "Creative destruction" manages to replace old industries with newer and more novel ones, especially within innovation-driven sectors.	Increased RDI spending fosters business innovation, thus massively contributing to the process of industrial transformation/ development and GDP growth.	RDI-related employment fosters new industry creation; at the same time, situation where certain jobs for various outdated or old sector may be displaced (or destroyed altogether) (Schumpeter, 2003)
Capital-Skill Complementarity Model	RDI investments are usually prone to favor adaptable and skilled labor whilst widening wage gaps	RDI funding has as an effect an increase in the demand for advanced technology, reinforcing growth but at the same time, it also manages to increase inequality if not addressed properly at nationwide levels.	RDI employment mostly benefits high-skilled workers, potentially leading to job polarization across the various regions of nations, unions, trade zones (Krusell, Ohanian, Ríos-Rull, & Violante, 2000)
Triple Helix Model	Collaborations between various types of	Targeted RDI investments foster the creation and development of start-ups	RDI employment in science, tech, and academia have a

	stakeholders (universities, industry, and government representatives – both at local and national levels) drive innovation.	(potentially leading them to attain the level of unicorns), tech clusters (accelerators, hubs, technology parks), and industrial competitiveness, thus boosting GDP levels.	direct impact the regional economic development (Etzkowitz & Leydesdorff, 2000) .
Regional Innovation Systems	The economic impact of RDI varies across regions based on the regions' capacity to assimilate innovation.	RDI investment is one of the drivers of regional economic disparities, given that they tend to benefit high-tech hubs (which have proven their worth time and time again) whilst those hubs or regions that lag will show signs of struggling.	RDI employment is centered around innovation hubs and accelerators; thus, unemployment rates will be on the rise in regions that do not manage to keep up the pace (Cooke, Cooke, & Etzebarria, 2004)

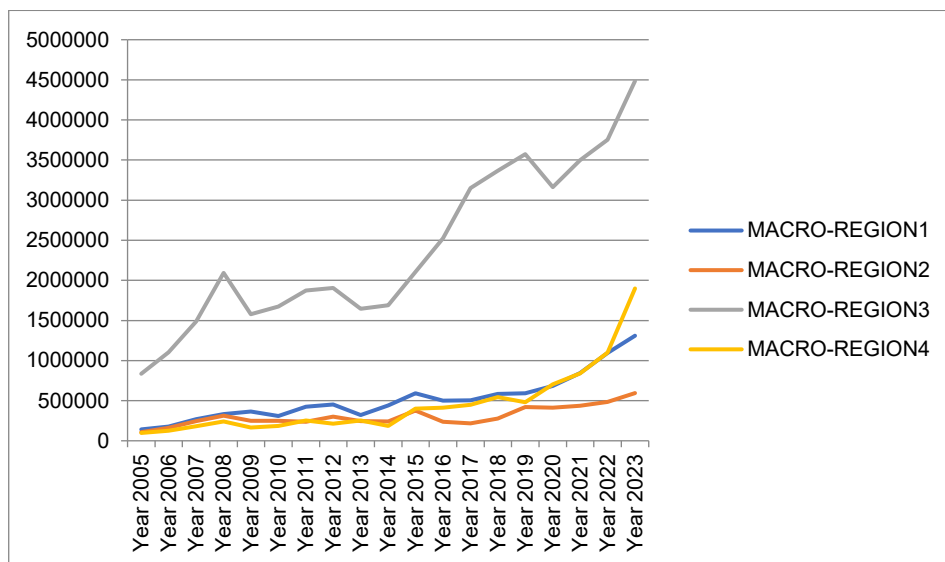
Source: own adaptation by the authors of multiple theoretical elements

results concerning productivity suggest that RDI investments do not always translate into immediate economic benefits due to inefficiencies, adoption delays, or misallocated or misused resources (Solow R., 1987). Another important critique has been brought forward by Zachariadis (2004); his study points to the fact that even though RDI has a positive impact on GDP growth in OECD countries, there is no uniform causal link (dependencies on elements such as education, infrastructure and diffusion of innovation being the ones that pose a broader impact on GDP growth). Other critiques noteworthy of mentioning include: subsidies targeting RDI investment and employment will result in the massive reliance of companies on public/government support (thus diminishing not only the opportunity of investing own funds towards RDI activities, but also decreasing the motivational aspects behind conducting RDI activities) (Almus & Czarnitzki, 2003); the structure of research institutions and the involvements stemming from the private sector have a far greater impact on economic development than straightforward RDI spending and employment (Guellec & van Pottelsberghe de la Potterie, 2004); government intervention in innovation is often inefficient unless well-structured policies are in place, and as such, private sources for financing RDI related spending and employment are much rather preferred from an efficiency perspective (Mazzucato, 2013). Several critiques (of the many that exist) have been presented in the previous paragraph. As a commonality, most of these critiques point towards similar ideas, namely that a mere increase in RDI spending and hiring will not necessarily lead to economic improvements and growth except for the situation in which structural inefficiencies (private-public sector collaborations, increased adaptability to novel technology through educational programs and transfer of knowledge, and the quality of various institutions) are addressed and resolved.

2. Romanian national and regional context

According to the Nomenclature of Territorial Units for Statistics (NUTS), Romania is divided into 4 NUTS 1 macro-regions (macro-region 1, 2, 3 and 4), 8 NUTS 2 regions, and 42 NUTS 3 counties (including Bucharest)(EUROSTAT, 2021). A dataset released by the National Institute of Statistics in 2021 highlights that 10.7% of the active enterprises within Romania exhibit characteristics related to innovation, having manifested innovation regarding products, process or a combination of the two (Romanian National Institute of Statistics, 2023). For 2024 levels, Romania has had a GDP of 356.39 billion dollars (tradegeconomics.com, 2025), and during the last 10 years, the country has managed to advance 9 positions in terms of ECI (economic complexity index) positions worldwide (Harvard Growth Lab, 2025), thus showcase the upward trend faced by the economy. In order to showcase the evolution of RDI related spending (expressed in thousands of RON) in the four Romanian macro-regions, the following graph is used:

Graph no. 1. Evolution of RDI spending (expressed in thousands of LEI) per Macro-region in the 2005-2023 timeframe in Romania

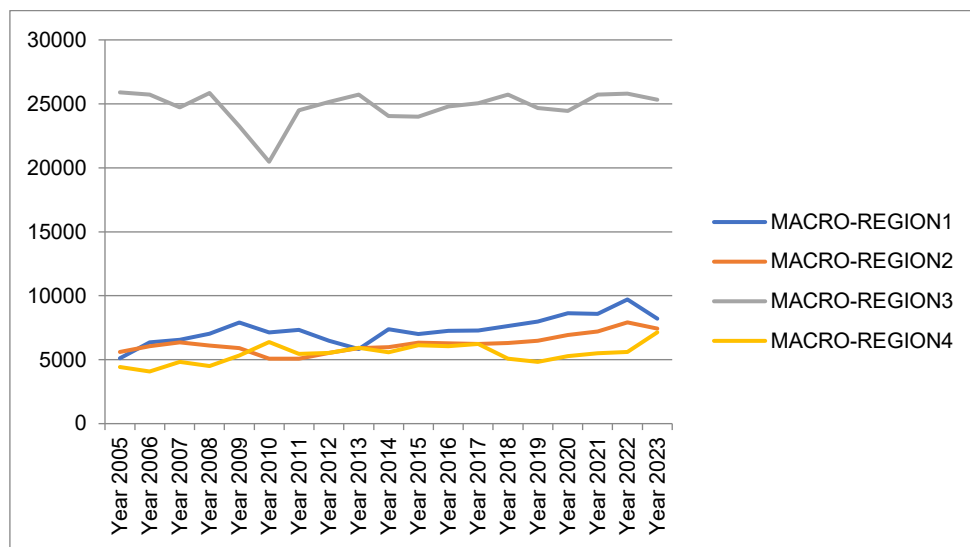


Source: Own adaptation by the authors based on data from the Romanian National Institute of Statistics database, section CDP104B (Romanian National Institute of Statistics, 2025), available online at <https://insse.ro>

Graph no. 1 highlights the dominance of Macro-Region 3 as opposed to the other regions of the country, also hinting at the concentration of certain urban/research centers and institutions which have developed over the year within this particular region. In general terms, all four regions have present solid growth over the analyzed period. Another conclusion that can be drawn from the table is the impact that certain disturbers (pandemics, trade wars, etc.) can have upon RDI spending throughout the

regions, and the recovery following times of economic downturn can be attributable (at least in part) to past investments made in the field on RDI.

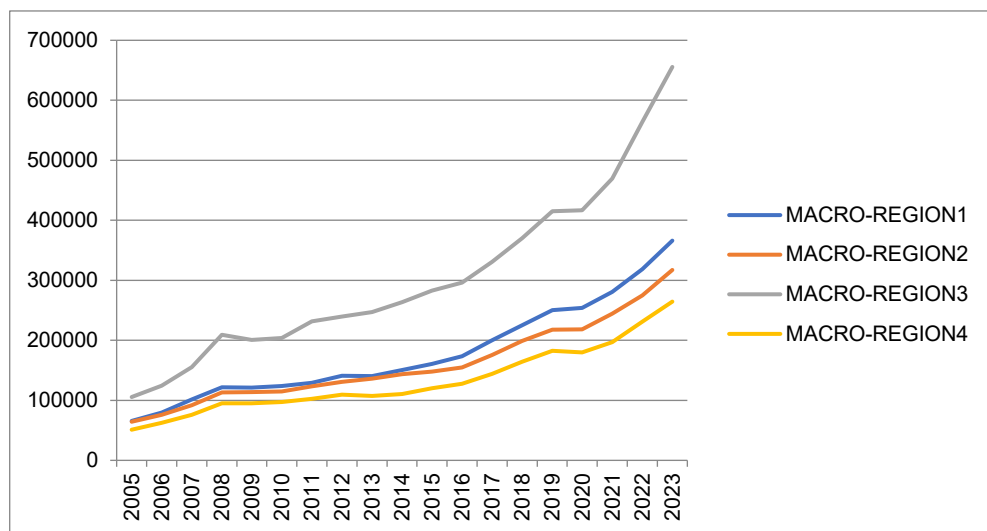
Graph no. 2. Hirings in RDI activities (expressed in number of individuals) per Macro-region in the 2005-2023 timeframe in Romania



Source: Own adaptation by the authors based on data from the Romanian National Institute of Statistics database, section CDP102E (Romanian National Institute of Statistics, 2025), available online at <https://insse.ro>.

Apart from RDI related spending, the four Macro-Regions of Romania have also had significant hiring surge related to RDI activities. Graph no. 2 aims to detail the evolution of such hirings throughout Romania, expressed in individuals. During the analyzed timeframe, Macro-Region 3 does manage to dominate the regions of the country, again pointing towards the existing infrastructure, and the existence of productive research centers, actively involved in development activities. Even though such concentration is beneficial for the respective regions (and it does assist when averaging for country levels), but the distribution of hiring highlights an important imbalance that exists within the country, not only in terms of RDI spending (as shown previously in Graph 1), but also in terms of RDI related hirings. The reasons behind such hirings within this specific region consider (but are not limited to) the following: the capital city of the country is included within this region, strong partnerships between the industry-academia-government, concentration of research centers, and concentration of headquarters of multinational corporations.

Graph no. 3. Evolution of GDP (millions of LEI) per Macro-region in the 2005-2023 timeframe in Romania



Source: Own adaptation by the authors based on data from the Romanian National Institute of Statistics database, section CON103 (Romanian National Institute of Statistics, 2025), available online at <https://insse.ro>

During the period 2005–2023, the evolution of GDP in Romania's NUTS 1 regions reflected the country's general economic trends, with variations between developed and less developed regions. In 2022, Romania's GDP was 286.4 billion euros, registering an increase of 18.7% compared to 2021. As seen in Graph 3, Macroregion 3 of Romania — which includes the regions of Sud-Muntenia and București-Ilfov — has the highest GDP compared to the other Macroregions mainly due to the dominant economic weight of the capital city, Bucharest, and its surrounding area. Bucharest alone generates over 25% of Romania GDP alone and this is due to a developed service sector, the high concentration of multinational companies and foreign investments. Macroregion 3 also concentrates the industrial powerhouse – mainly the oil refinery from Ploiesti, automotive industry (Mioveni) as well as several energy production plants.

3. Data and methodology

We will analyze the impact of RDI expenditures as well as hirings in RDI activities on the regional economic growth measured by the nominal GDP, using a panel data approach. A panel model refers to a statistical framework that is used to analyze how the selected variables influence the economic growth of countries or regions over time; it allows for the analysis of multiple regions over multiple time periods, capturing both cross-sectional (across entities) and time-series (over time) variations. We have collected annual data from the Romanian National Institute of Statistics for the following

variables: hirings in RDI activities, RDI expenditures and GDP in the 4 Romanian Macro-regions during the last 19 years (2005 – 2023). We will develop an **ARDL panel data model for the GDP in Romania**, using **R&D (Research and Development) spendings** and hirings in RDI activities as explanatory variables across regions and over time. The Bounds Test proposed by Pesaran and Shin (1999) and Pesaran et al. (2001) was used to investigate the cointegration between the variables. Units root tests (Dickey Fuller (1979), Phillips and Perron (1988) and Levin and Lin and Choo (2002)) were employed for the variables in order to identify the integration order of each. Multicollinearity between the dependent variables will be checked using variance inflation factor (VIF) test.

We will employ the Hausmann test (1978) to indicate if the fixed effects model or the random effects model is appropriate. Then we will estimate the parameters of an ARDL(p,q,q,...q) model that can be written as follows:

$$y_{it} = \sum_{j=1}^p \delta_j y_{i,t-j} + \sum_{j=0}^q \beta'_{ij} X_{i,t-j} + \varphi_i + e_{it} \quad (1)$$

where y_{it} is the dependent variable, X_{it} is a $k \times 1$ vector of independent variables, δ_j is the coefficient of the lagged dependent variable, β'_{ij} is a $k \times 1$ coefficient vector, φ_i is the unit specific fixed effects, $i = \overline{1, N}$, $t = \overline{1, T}$, p and q are optimum lag orders and e_{it} is the error term. Dumitrescu Hurlin (2012) causality test will be employed to detect causal relationship between the variables across the panel.

4. Results

The data collected for the 3 variables in our model were taken in log, in order to eliminate the trend. Stationarity tests indicated that all the 3 variables in log are integrated of order 1, that is $I(1)$. The Bounds Test proposed by Pesaran and Shin (1999) and Pesaran et al. (2001) confirmed the cointegration between the chosen variables. This means that the correlation between these variables is not a short-lived one, but a permanent one, and one that can be recovered every time there is a perturbation.

We have chosen to estimate a regional fixed effect ARDL model. The estimators of the short run and long run parameters of model are presented in Table 2.

The model reveals that in the short-run, the variables with a significant impact on the regional development measured by the GDP are the lagged GDP, 2 period lagged hirings in RDI activities as well as one and two period lagged RDI expenditures. As regards the long-run results, all variables taken into account have a positive and statistically significant impact on the economic growth measured by GDP - RDI expenditures as well as hirings in RDI activities. The error correction term from the long run representation is statistically significant at the 0.01 level and its negative sign confirms the correct specification of the model.

Table 2. Panel ARDL model estimations

Long-run coefficients			Short-run coefficients		
Variable	Coefficient	P - stat	Variable	Coefficient	P- stat
LGEMPL	0.182623***	0.0003	COINTEQ01	-0.813112***	0.0031
LGRDE	0.515715***	0.0000	D(LGGDP(-1))	0.502322**	0.0319

			D(LGEMPL)	0.108778	0.3943
			D(LGEMPL(-1))	0.040235	0.6485
			D(LGEMPL(-2))	0.154746*	0.0662
			D(LGRDE)	-0.171848	0.2783
			D(LGRDE(-1))	-0.276877***	0.0016
			D(LGRDE(-2))	-0.099422***	0.0067
			C	5.400101***	0.0042
			@TREND	0.021515***	0.0004

***Coefficient is significant at the 0.01 level (2-tailed). ** Coefficient is significant at the 0.05 level (2-tailed). *Coefficient is significant at the 0.1 level (2-tailed).

Source: Authors' calculation using Eviews 10

The analysis of the cross section results on short run has revealed the same situation across the 4 macroregions. In addition, in macroregion 3 the results reveal a short run correlation between the hirings in RDI activities and the regional GDP. The diagnostic tests were employed in order to confirm that the model is a valid one. The Jarque Bera test for normality confirmed the normality of the errors of the model. There are several causality tests that are used in the literature, the most known being the Granger (1969) test as well as the Dumitrescu and Hurlin (2012) test. The **Dumitrescu-Hurlin causality test** is a **panel data** version of the **Granger causality test**, used to detect causal relationships between variables across a panel of individuals (macroregions – in our case) over time.

Table 3. Dumitrescu Hurlin causality test results

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.
LGGDP does not homogeneously cause LGEMPL	2.04144	0.96430	0.3349
LGEMPL does not homogeneously cause LGGDP	2.21850	1.15667	0.0474
LGRDE does not homogeneously cause LGGDP	3.15277	2.17168	0.0299**
LGGDP does not homogeneously cause LGRDE	3.93269	3.01900	0.0025***

** Coefficient is significant at the 0.05 level (2-tailed). ***Coefficient is significant at the 0.01 level (2-tailed). Source: Authors' calculation using Eviews 10

The causality test confirmed a feedback causality between the economic growth and RDI expenditures. As regards the impact of hirings in RDI activities on the economic growth, there is only a unilateral causality between the as hirings in RDI activities and the economic growth.

Conclusions and discussions

The impact of **R&D investment** on **regional economic growth** is a widely studied topic in economics, often explored through the lens of innovation-driven growth theories. Most studies find that higher RDI correlates with higher regional GDP per capita and

productivity growth. Theory reveals a spatial heterogeneity; effects are stronger in regions with good infrastructure, skilled labor, and existing innovation ecosystems. Macroeconomic policies should promote RDI in lagging regions in order to reduce inequality and encourage cooperation between government, firms as well as universities. A good labor mobility, partnerships, and infrastructure would encourage the spread of innovation benefits. The **impact of R&D hiring on regional economic growth** is a more specific way to assess the link between innovation and development that focuses on the **human capital** dimension - how employing researchers, scientists, and technical staff influences a region's economy. Skilled workers in R&D generate knowledge, innovation, and problem-solving capacity that drive **productivity** and **technological advancement**. Employees hired into R&D roles often collaborate, publish, or move between firms—helping diffuse innovation across the region. A larger R&D workforce can signal the presence of an innovation-friendly ecosystem, attracting further investment and startups. R&D staff may launch spin-offs or startups, contributing directly to regional job creation and economic diversification.

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- D

HEALTH AND RENEWABLE ENERGY INTEGRATION: A SUSTAINABILITY ASSESSMENT FRAMEWORK FOR COMBATING TERRITORIAL DISPARITIES IN HEALTH ACCESS

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Abstract: *Health is a fundamental pillar of human development and a right guaranteed by the Romanian Constitution. Nonetheless, the Romanian health system is facing chronic issues, emphasized by underfunding, regional inequalities, the migration of the medical personnel, and limited access to services for the vulnerable population.*

Territorial disparities in the access to medical services represent a persistent socio-economical challenge, particularly in the rural and disadvantaged areas. Digital health solutions (e-Health) are essential for bridging this gap, but their long-term impact is conditioned by the resilience and energy sustainability of the infrastructure.

Although e-Health solution, such as telemedicine and remote monitoring, offer a powerful lever for reducing territorial disparities, their long-term success, especially in rural and isolated areas is highly dependent on the resilience and sustainability of the supply infrastructure. The exclusive reliance on the conventional power grid exposes essential services to the risk of power outages and voltage fluctuations, a phenomenon very common in disadvantaged environments. Therefore, the integration of green renewable energy sources, such as photovoltaic panels or small wind systems, becomes a key factor in amplifying the socio-economic impact. This approach not only ensures the energy autonomy and reliability of digital health access points, but also contributes to reducing long-term operational costs and achieving national climate sustainability goals. Therefore, studying the synergy between e-Health and renewable energy is essential for developing truly equitable and resilient healthcare systems.

The paper proposes a conceptual evaluation framework and analyses the theoretical arguments for energy integration, in the absence of aggregated empirical data at the national and especially regional level. The synergistic adoption of e-Health technology and renewable energy sources represents an effective lever for combating socio-economic and territorial inequities in the healthcare sector.

Key words: *e-Health; renewable energy; regional disparities; socio-economic impact; sustainability; health access.*

JEL classification: *I18; O18; Q20; Q56; R11*

1. Introduction

The Romanian healthcare system faces severe territorial disparities and chronic underfunding, which limit its ability to ensure equitable access to medical services. With

public health expenditures of only 6.3% of GDP, well below the EU average of 9.8% (Eurostat, 2025) and a life expectancy nearly six years lower than the EU average (75 vs. 81 years) (Eurostat, 2025), the socio-economic and health disparities between regions (e.g., North-East vs. Bucharest-Ilfov) are deeply visible. These imbalances are accentuated by outdated infrastructure and the migration of medical personnel, leaving rural and disadvantaged areas with insufficient medical coverage. Jula and Jula (2013) argue that sustained regional growth depends on the ability of local economies to transition toward sectors with higher added value, which directly influences employment patterns.

E-Health is defined as “an emergent field at the intersection of medical informatics, public health and business, referring to healthcare services and information provided or improved through internet and related technologies” (Eysenbach, 2001). Similar to how banking digitalization provides financial services to isolated or underbanked populations (through mobile banking), (Oprea & Nicula, 2026) health digitalization (e-Health) is improving the equity of access to healthcare for rural or disadvantaged communities. Thus, telemedicine and remote monitoring become the main ways of reducing distances and waiting times, contributing to the development of the digital society.

Medical care is limited rural areas because due to the lack of medical infrastructure. Similar patterns appear across other digital public services, where unequal access to digital infrastructure widens territorial gaps and restricts vulnerable communities from benefiting from modern digital solutions (Oprea, 2024). Since most healthcare institutions are located in urban regions, residents of rural communities must travel long distances to urban areas to receive treatment for even minor health issues, a situation that leads to medical tourism. (Currie et al., 2015).

In this context, the large-scale implementation of e-Health solutions (telemedicine, remote monitoring) reduces geographical barriers, improves cost and time efficiency, and expands access to health services for vulnerable groups (Ruhdiat, 2025). Oprea et al. (2025) note that digital innovation generates real benefits only when supported by strong and inclusive infrastructure, as insufficient operational capacity can deepen territorial inequalities. Their argument is directly relevant for e-Health, where inadequate digital and energy infrastructure limits the ability of vulnerable regions to fully benefit from modern medical services.

E-Health must be sustainable and resilient for a long-term and it is imperative to address its source of power supply. Dependence on traditional energy grids can generate vulnerabilities in rural areas and runs counter to environmental objectives. Oprea (2025) argues that digital transformation cannot function reliably without a robust technological and operational infrastructure, as insufficient system resilience amplifies existing disparities and limits the benefits of innovation.

The integration of solar energy solutions into rural healthcare is an impact multiplier that brings operational resilience and quality improvements (Soto et al., 2022). The reliable power supply provided by these systems extends operating hours and enhances lighting for procedures, enabling more accurate diagnoses and superior medical services. A benefit is to ensure the safety and potency of vaccines through solar refrigeration (Kapuria et al., 2024). From a sustainability perspective, solar solutions strengthen the financial independence of facilities by reducing long-term operational costs and contribute to environmental sustainability by lowering the carbon footprint (Al-Rawi, 2023).

Therefore, the present study adopts a conceptual approach and analyses the synergy between e-Health and Renewable Energy and how these two concepts optimize energy performance and social sustainability for service reliability and the reduction of disparities. Based on these gaps, the objective of this article is to examine how renewable energy enhances the sustainability of digital healthcare systems and to construct a PCA-based Green Resilience Index that quantifies the link between digital healthcare, energy autonomy and regional disparities.

2. Literature review

The integration of e-health and renewable energy is recognized as a new approach that reduces territorial disparities in health access, particularly in rural and underserved regions. The literature highlights the role of reliable, sustainable energy, especially solar and hybrid systems, which makes possible continuous healthcare delivery, and supports digital health infrastructure, and advances sustainability goals.

Rural and remote communities globally face persistent health access inequalities, often due to unreliable or absent energy infrastructure, which impedes the operation of healthcare facilities and digital health services (Franco et al., 2017; Izuka et al., 2023; Teklemariam et al., 2025). According to Jula and Jula (2000), structural disparities in productivity and sectoral specialization are determinants of the long-term competitiveness gap between Romanian regions. These disparities are accentuated by geographic isolation, limited resources, and underdeveloped transportation and energy networks (Izuka et al., 2023; Tu et al., 2025).

Solar and hybrid renewable energy systems are widely documented as effective solutions for powering healthcare facilities in off-grid or energy-insecure areas. These systems ensure the operation of medical equipment, vaccine refrigeration, lighting, and digital health platforms, leading to improved healthcare quality and accessibility (Olatomiwa et al., 2022; Alsaad et al., 2024; Teklemariam et al., 2025).

Hybrid systems, which combine solar, wind, and storage, are particularly effective in providing reliable, cost-efficient energy (Ayodele et al. 2021).

The adoption of renewable energy also reduces operational costs, carbon emissions, and enhances community resilience (Izuka et al., 2023; Alsaad et al., 2024; Teklemariam et al., 2025).

E-health initiatives, such as telemedicine, remote patient monitoring, and digital health records, depend on stable energy supplies and robust ICT infrastructure. The literature identifies indicators for smart rural healthcare, including the number of patients monitored remotely, access to mobile health clinics powered by renewables, and the availability of digital health data through reliable, renewable-powered servers (Maja et al., 2022).

Comprehensive sustainability assessment frameworks for renewable energy integration in healthcare emphasize multi-dimensional evaluation: environmental, economic, social, and technological (Campos-Guzman et al., 2019; Tian et al., 2024).

Life Cycle Analysis (LCA) combined with Multi-Criteria Decision Making (MCDM) is identified as the most robust methodology for evaluating the sustainability of energy-health projects, allowing for the selection of context-appropriate indicators and the balancing of trade-offs (Campos-Guzman et al., 2019; Abdolmaleki & Bugallo, 2025).

Frameworks should consider policy, financing, and stakeholder engagement to ensure long-term viability (Alsaad et al., 2024; Mohamed & Elsayed, 2025).

Challenges include high initial investment costs, maintenance, technological constraints, and the need for specialized expertise (Olatomiwa et al., 2022, Izuka et al., 2023). Policy frameworks, government support, and innovative financing models are very important to overcome these barriers and scale up renewable-powered e-health solutions (Mohamed & Elsayed, 2025). Community engagement and capacity building are also important for sustainability and local ownership (Teklemariam et al., 2025).

3. Methodology

To argue and quantify the necessity and complexity of the interactions between ecological sustainability, technological development, and e-health, we chose to construct a composite index, the Green Resilience Index (GRI). The objective is to determine whether the GRI combines these factors in a manner that supports the idea that digitization (e-health) becomes sustainable through the use of renewable energy. Principal Component Analysis (PCA) was utilized to add methodological rigor to the conceptual framework built upon the dimensions of digitization, energy autonomy, and health. Firstly, PCA reduces the redundancy among proxy variables, synthesizing information from strongly correlated indicators into a reduced number of latent components. Secondly, the method allows for obtaining robust scores that are comparable across countries and years, avoiding the arbitrariness of simple aggregation. The PCA method, provides a solid statistical foundation for constructing composite indices, confirming that the conceptual dimensions are empirically supported by the data structure. Thus, PCA is not an end in itself, but a tool that ensures the consistency and validity of the variables subsequently introduced into the econometric model, thereby strengthening the link between theory and empirical analysis.

For the construction of the index, there were utilized the following proxy variables: Households - type of connection to the internet (2003-2021)%; Internet use: interaction with public authorities; Individuals' level of computer skills [PC_IND]; Share of renewable energy-overall(%);Energy import dependency by products(%);Population unable to keep home adequately warm by poverty status(%);Energy productivity (KGOE); Health care expenditure all provider(million euro); Generalist medical practitioner(nr); Total health care expenditure(million euro).

During the database construction phase, it was found that for several relevant variables within the conceptual framework (e.g., digital skills [PC_IND], energy productivity, health expenditure), the data available in Eurostat were either discontinuous or entirely absent for the 2015–2023 period. To maintain temporal coherence and comparability across countries, alternative proxy variables with complete or extended coverage were selected, such as the internet connection rate, online interaction with public authorities, the share of renewable energy, and the density of general practitioners. Where data were missing for the years 2018–2023, a calibrated extrapolation method was applied: an annual increase of +1.0 percentage point for Sweden and Denmark (countries with high levels and stable trends), and +1.2 percentage points for Estonia, Greece, Portugal, and Romania (countries undergoing recovery). This adjustment allows for the coherent completion of the time series and their integration into the PCA analysis without distorting structural trends.

4. Results and Discussion

The selection of the variables used is based on economic and social theories that explain the role of infrastructure, digital capital, and territorial equity in regional development. The share of renewable energy in gross final consumption reflects the structural capacity of an economy to sustain digital medical infrastructure with green sources, reducing vulnerability to interruptions and operational costs, consistent with critical infrastructure theory. Energy import dependency serves as an inverse proxy for energy autonomy; economies with high dependency are more exposed to external shocks that affect the continuity of digital medical services, especially in rural areas. Energy productivity captures systemic efficiency and the capacity to generate economic value with limited resources, correlating with the sustainability of e-Health infrastructure. Energy poverty expresses infrastructural and social vulnerability and is associated, within the theory of territorial equity, with limited access to public services, including telemedicine. Fixed internet penetration and basic digital skills are fundamental in digital capital theory, directly influencing the population's capacity to access and utilize e-Health services, while the lack of these resources perpetuates the "digital divide." The use of e-government services is a proxy for the digital maturity of public administration and the degree of integration of medical services into the national digital ecosystem. Finally, public health expenditure per capita reflects the system's capacity to sustain modern medical services, including teleconsultations, and is correlated with the availability of medical infrastructure in disadvantaged areas.

The Green Resilience Index (GRI) was conceived to measure a multidimensional construct, demonstrating that resilience is an intersection of the dimensions of Health, Digitization (e-Health), and Energy. PCA was performed on the correlation matrix to extract the components. By using PCA, the index empirically confirms the interdependence between these factors. For example, it was demonstrated that Digitization is sustainable only if coupled with Renewable Energy, an essential aspect of modern resilience. By including variables such as Energy Imports (with a negative loading), the Index evaluates a region's capacity to ensure its autonomy. Green resilience implies reducing strategic vulnerability to global energy market shocks and geopolitical dependence. Digitalized health (e-health) is a critical infrastructure, and the GRI index assesses not only the existence of this technology but also its energy sustainability, ensuring that vital services are not interrupted by supply crises.

4.1 Principal Component Selection

According to the Kaiser-Guttman criterion (Eigenvalue > 1), only components with an eigenvalue greater than 1 are retained. The three retained components cumulatively explain 82.74 of the total variance. This indicates that the majority of the information within the initial dataset is conserved.

Tabel 4.1. Eigenvalue

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	4.714576	2.289873	0.4715	4.714576	0.4715
2	2.424703	1.289095	0.2425	7.139279	0.7139
3	1.135609	0.337098	0.1136	8.274888	0.8275
4	0.798511	0.308433	0.0799	9.073399	0.9073
5	0.490078	0.180869	0.0490	9.563478	0.9563
6	0.309209	0.240083	0.0309	9.872687	0.9873
7	0.069126	0.025085	0.0069	9.941813	0.9942
8	0.044041	0.029894	0.0044	9.985854	0.9986
9	0.014146	0.014146	0.0014	10.00000	1.0000

Source: Eviews output generated by authors

PC 1: 4.714576 > 1 ; PC 2: 2.424703 > 1 ; PC 3: 1.135609 > 1

Principal Component 1, or the "General Resilience Factor," explains 47.15% of the variance. All variables show a large positive loading, suggesting that PC1 represents a common factor or a general dimension of resilience, where a higher value on this component signifies a better overall state. PC1 appears to be dominated by variables related to Health care expenditure, share of renewable energy-overall, and housing infrastructure, Population unable to keep home adequately warm by poverty status. The Energy Import variable acts in the inverse direction, which is logical for green resilience (resilience is higher when import dependency is lower).

The fact that health and renewable energy are the most strongly associated and share the same sign within the most important component (PC) suggests that they are fundamental and interdependent dimensions of "green resilience." A high score on this component simultaneously signifies a robust health system and reduced energy dependence on polluting sources.

Table 4.2. –Principal Component eigenvectors

Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	PC 9
TOTAL_HEALTH...	0.321408	0.428190	-0.011314	0.143202	-0.308612	0.036191	-0.188191	0.223893	0.103054
SHARE_OF_REN...	0.374073	0.209685	-0.409639	0.078562	-0.038740	0.078218	0.611164	-0.449902	-0.242021
POPULATION_U...	-0.382542	0.270329	0.227542	-0.132048	-0.101950	0.246666	0.591553	0.516064	-0.154522
INTERNET_USE_...	0.364466	-0.014798	-0.035551	-0.649472	0.232709	-0.030615	0.191993	0.140509	0.576344
INDIVIDUALS_L...	0.217088	-0.301732	0.561872	0.462039	-0.140114	0.165695	0.309529	-0.149741	0.409064
HOUSEHOLDS_...	0.385128	-0.133870	0.033498	0.101758	0.513052	0.603264	-0.156458	0.264124	-0.317629
HEALTH_CARE_...	0.321408	0.428190	-0.011314	0.143202	-0.308612	0.036191	-0.188191	0.223893	0.103054
GENERALIST_M...	-0.231899	0.370928	-0.200010	0.470264	0.606169	-0.162214	0.077063	0.064730	0.378947
ENERGY_PROD...	0.258970	0.257667	0.579371	-0.094578	0.298871	-0.534723	0.042224	-0.068547	-0.374424
ENERGY_IMPORT...	-0.240823	0.450665	0.293945	-0.244203	0.062058	0.475244	-0.202094	-0.556952	0.110096

Source: Eviews output generated by authors

Principal Component 2 (PC2) – the "technological/digital factor" explains 24.25% of the variance. This component is most strongly correlated with internet use (Internet use: interaction with public authorities) and Individuals using the internet (Individuals' level of computer skills). PC2 can be interpreted as the "digitization and information access" dimension or "technological resilience."

The positive association between digitization/internet and renewable energy in PC2 suggests that digitization processes (and, consequently, e-Health potential) are more

advanced in areas that also have a higher share of renewable energy. This correlation indicates an incipient sustainability—the necessary infrastructure for digitization can be supported, at least partially, by a green energy source. To further support this argument, we look at the direct correlation between the key variables: the correlation between Share of renewable energy and Individuals using the internet Individuals' level of computer skills (digitization) is 0.6092 (positive and strong); the correlation between Share of renewable energy and Health care expenditure is 0.792778 (positive and very strong).

Tabel 4.3. Ordinary correlation

TOTAL HEALTH CARE EXPE...	SHARE O...	POPULATI...	INTERNET...	INDIVIDUAL...	HOUSEHO...	HEALTH C...	GENERALI...	ENERGY ...	ENERGY I...	
TOTAL HEALTH...	1.000000									
SHARE_OF_REN...	0.792778	1.000000								
POPULATION_U...	-0.301678	-0.628144	1.000000							
INTERNET_USE...	0.427294	0.609237	-0.611906	1.000000						
INDIVIDUALS_L...	0.079439	0.018365	-0.464832	0.110515	1.000000					
HOUSEHOLDS...	0.389135	0.596042	-0.763732	0.662215	0.539777	1.000000				
HEALTH_CARE...	1.000000	0.792778	-0.301678	0.427294	0.079439	0.389135	1.000000			
GENERALIST_M...	-0.003250	-0.112599	0.521234	-0.572412	-0.509356	-0.390490	-0.003250	1.000000		
ENERGY_PROD...	0.588720	0.298088	-0.193214	0.497632	0.362591	0.376763	0.588720	-0.104871	1.000000	
ENERGY_IMPORT...	0.064505	-0.335208	0.843414	-0.317851	-0.458654	-0.492745	0.064505	0.502674	0.130393	1.000000

Source: Eviews output generated by authors

In conclusion, the correlations demonstrate a strong and direct correlation. If e-health is represented by Digitization and Health, both are strongly correlated with Share of renewable energy.

The generated PCA model strongly supports the hypothesis that health digitization (e-health) is intrinsically linked and potentially sustained by the use of renewable energy (energy sustainability), collectively forming a coherent "Green Resilience Index". Factor 1 (PC1) shows that successful general resilience combines health with renewable energy. Factor 2 (PC2) indicates that digitization is a separate dimension, but it is also positively associated with renewable energy. In practical terms, the generated Green Resilience Index favors those regions/entities where digitalized health systems (e-health) are accompanied by a smaller energy footprint and a higher share of renewable sources.

The negative sign of the loading for the Energy import dependency by products variable on PC1 is an essential element and highly coherent with the idea of Green Resilience and Autonomy. The Energy import dependency by products variable has a loading of 0.240823 on Principal Component 1, which is the foundation of the Green Resilience Index (explaining 47.15% of the variance).

PC1 being the main resilience factor, is a measure that we want to be as high as possible (a high score = high resilience). The negative loading indicates an inverse relationship. For the score on the Green Resilience Index to increase, the level of Energy imports must decrease. This negative relationship validates how the Green Resilience Index was constructed from the perspective of energy security. An energy system is considered resilient when it is autonomous and isolated from external shocks (volatile prices, geopolitical crises). Energy import is precisely the source of this vulnerability.

In the specific context of health digitization (e-health) and sustainability, e-health systems (servers, networks, digital medical equipment) are critical infrastructures that

require constant and stable power supply. The model suggests that the sustainability of this digital infrastructure is best ensured when it is powered by local renewable energy, or does not depend on an energy source vulnerable to interruptions or external decisions (i.e., Energy import dependency by products). The negative loading of energy imports is not only logical but consolidates the quality of the Green Resilience Index. It ensures that the index rewards those entities that not only implement e-health (PC2) and use renewable energy (PC1) but which have also reduced their strategic vulnerability by diminishing their dependence on external energy sources.

The final Index is calculated as a weighted sum of the scores of the three principal components, using the proportions of explained variance as weights to reflect the relative importance of each factor.

$$\text{Green Resilience Index} = \lambda_1/\Sigma \lambda^*PC_1 + \lambda_2/\Sigma \lambda^*PC_2 + \lambda_3/\Sigma \lambda^*PC_3$$

$$\text{Green Resilience Index} = 0.5698*PC_1 + 0.2931*PC_2 + 0.1372*PC_3$$

This aggregate index offers a synthetic and robust measure that captures 82.74% of the variance of green resilience, where higher scores indicate superior performance across the three key dimensions.

The Green Resilience Index developed through Principal Component Analysis (PCA) is not merely an aggregate measure; rather, it unveils a factorial structure that confirms the interdependence between energy sustainability and the digitalization of the healthcare system (e-health).

The results highlight that investments in e-Health cannot be dissociated from the green transition and energy policies. Reducing FI (Factor Importer – *presumably F2/Energy Vulnerability*) and increasing IAE (Energy Autonomy Index – *likely F1/Renewable Energy Share*) transforms telemedicine from an intermittent service into a reliable one, with a disproportionate impact on rural areas. Simultaneously, strengthening digital skills and connectivity infrastructure remains essential for equity. Therefore, public policies must be coherent and interconnected, simultaneously targeting health digitization and energy autonomy to ensure not only increased access but also continuity and sustainability. The paper thus provides a methodological and empirical framework that can guide the prioritization of investments and the foundation of integrated green e-Health policies, capable of reducing regional disparities and strengthening social resilience.

The complete table of the calculated Resilience Index is presented as follows:

Tabel 4.4. Green Resilience Index

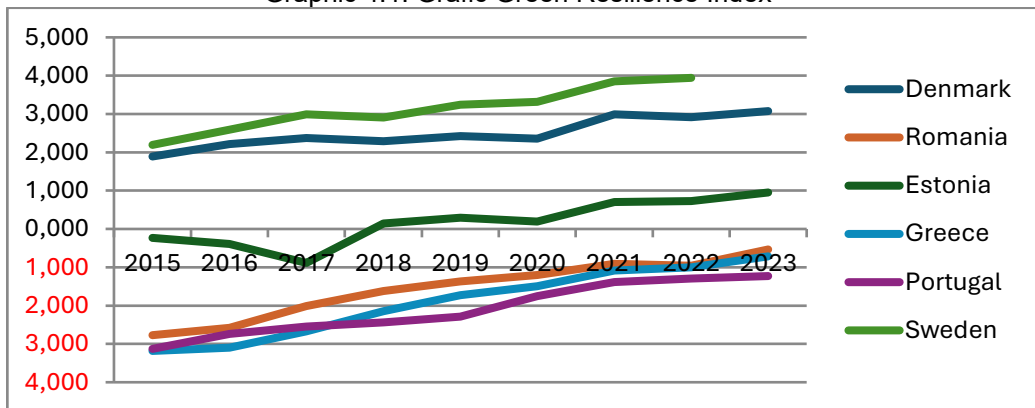
	Denmark	Romania	Estonia	Greece	Portugal	Sweden
2015	1.891	2.771	0.230	3.183	3.129	2.194
2016	2.214	2.584	0.393	3.101	2.740	2.592
2017	2.370	2.015	0.886	2.669	2.550	2.992
2018	2.292	1.618	0.142	2.143	2.438	2.910
2019	2.423	1.370	0.295	1.727	2.288	3.244

2020	2.357	1.201	0.195	1.493	1.750	3.316
2021	2.994	0.911	0.699	1.083	1.383	3.855
2022	2.919	0.958	0.732	1.002	1.296	3.943
2023	3.076	0.535	0.952	0.715	1.229	

Source: Generated by the authors from index output by Eviews

Based on the generated Green Resilience Index we calculated using Principal Component Analysis, the differences between countries are clearly structured into three categories: Leaders, Middle Ground, and Rear Guard. Denmark and Sweden are positioned as Leaders, showing the highest scores (consistently above +2.0), a fact demonstrated by their excellence in PC1 (Sustainability and Infrastructure), which holds a dominant weighting of 57.1% in the Index. Estonia represents the Middle Ground, demonstrating rising resilience, with scores that have shifted from negative to positive, reaching nearly +1.0 in 2023, due to rapid progress in digitization and reduced energy vulnerability.

Graphic 4.1. Grafic Green Resilience Index



Source: Generated by the authors from index output by Eviews

Conversely, Romania, Greece, and Portugal form the Rear Guard, maintaining scores below zero, due to a double penalty: poor performance in PC1 and a massive negative contribution from PC2 (Energy Vulnerability), which explains 29.31% of the index and is dominated by energy import dependency. This visual divergence necessitates accelerated investment policies in the vulnerable states to reduce resilience disparities.

5. Conclusion

The analysis shows that e-Health solutions have a substantial potential to reduce regional disparities in healthcare, particularly in vulnerable rural areas in Romania, by eliminating physical distance. However, the paper confirms that theoretically, telemedicine alone is not enough because energy vulnerability and lack of operational

resilience caused by unstable power grids undermine the benefits of equity. The integration of renewable energy is a strategic pre-requisite for long-term success.

The paper introduces a new and relevant concept, Green Resilience Index based on a rigorous methodology that surpasses a simple aggregation of indicators.

The key hypothesis was empirically demonstrated: health digitization (e-Health) is intrinsically linked to energy sustainability (renewable energy). This interdependence is a highly current theme at the intersection of Information and Communication Technology and sustainable development goals.

The analysis has a few limitations. The lack of data obliged us to apply a calibrated extrapolation method (annual increases of (+1.0) or (1.2) percentage points to maintain temporal coherence for the years 2018–2023.

PCA identified a three-factor structure that explains 82.74% of the variance. The residual variance (over 17% remains unexplained), suggesting that there are other resilience factors that are not captured by the current set of variables.

The Index is based exclusively on quantitative variables. It does not include essential qualitative factors for resilience, such as institutional trust, quality of governance, or political stability, which directly influence the implementation of green and digital policies.

To counteract these limitations, we propose that future research should utilize panel regression models to isolate temporal effects (Fixed Effects) and attempt to include data at the sub-national or regional level (NUTS-2) to capture internal disparities.

Based on resilience and the double dividend principle (social and operational), we bring some suggestions to decision-makers: the Government and the financial authorities should allocate funds for e-Health infrastructure only if minimum mandatory Energy Autonomy Index (EAI) is achieved (i.e.: 70%) in areas with a high level of energy risk. This ensures that the investment is resilient to failures (low FI). The performance evaluation of e-Health projects must go beyond adoption indicators (such as the number of users) to include resilience indicators, such as the Frequency of Incidents (FI), in order to measure the real impact on service reliability. Policies ought to acknowledge that, although the initial cost of green infrastructure may be higher, it is justified by a Life Cycle Cost (LCC) analysis, demonstrating a reduced Average Operational Cost (AOC) in the long term, thus supporting the financial sustainability of the healthcare system.

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BIBLIOMETRIC ANALYSIS OF EMPIRICAL RESEARCH ON SUSTAINABLE BUSINESS MODELS AS INNOVATIVE MODELS

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Abstract: *In the contemporary environment where businesses are developing rapidly, sustainability has gone from a simple trend to a true business imperative. Thus, a question as simple on the surface as it is essential in detail, is raised for discussion: What and how is a sustainable business model created? Discovering the details through the answer we will give to this question will perhaps lead us to the climax of this study. We propose qualitative research through the tools of bibliometric analysis. Since the specialized literature presents a wide variety of subcategories, dimensions, factors, archetypes, strategies and development contexts for sustainable business models, we focused on a selection appropriate to our research objective. During the exploration process, the chosen articles were identified by their explicit relevance to the topic, including case studies exclusively on sustainable business models. Subsequently, 20 publications that best correspond to the specific purpose and context of our study were selected and retained for bibliometric analysis. Our research methodology is carried out in two distinct phases. The first phase consists of extracting and analyzing relevant works that can be included in the bibliometric analysis. The second phase involves the selection and examination of previously identified works and is structured in two additional steps: manually locating works with a high number of citations and significant influence and identifying essential elements for the purpose of our study. The novelty of this study consists in an analysis focused exclusively on sustainable business models and on the way in which these structures, dedicated to the circulation of values, evolve under the influence of technological progress and ecological practices, thus contributing to the development of more responsible business models. We aim that by correctly reflecting on the data collected and then establishing the appropriate answers, at the end of the study we will obtain valid conclusions that will guide us towards a future of entrepreneurship developed on sustainable business models.*

Keywords: *bibliometric analysis; sustainable business models; social responsibility; innovative models.*

JEL classification: *F18; M14; O10; O47.*

1. Introduction

Under the inspiration of various promotional techniques, companies tend to constantly publicize their own identity in the market.

Related to this aspect, we mention the argument that more sustainable business models represent: "A holistic and systemic reflection of how a company operationalizes its strategy, based on resource efficiency (through operations and production,

management and strategy, organizational systems, governance, evaluation, reporting and change), so that the results have more value and contribute to sustainability more than the inputs (in terms of materials and resources that are transformed into products and services, economic value, human resources and environmental value).

The business model is affected by the company's resources (tangible and intangible), the supply chain and the company's stakeholders (internal, interconnected and external), including the environment (inside and outside the company)" (Lozano, 2018: 6).

Through this bibliometric research, we aim to analyze the empirical studies conducted on sustainable business models from the specialized literature in order to:

- *Identify the dimensions that underlie the evaluation of a sustainable business model.* To effectively assess a sustainable business model, it is essential to clearly define the key dimensions that make up sustainability. We start from the hypothesis that the three key dimensions will stand out: the economic, social and environmental dimensions. All of these dimensions are fundamental for an objective and complete analysis of the sustainability of a business model.
- *Establish the extent to which indicators are used to quantify these dimensions and what these indicators are.* Clear and objective quantification of sustainability involves the use of measurable and relevant indicators that effectively reflect a company's performance. Along with these, social and environmental indicators are necessary.
- *Determine the type and size of the research populations used as samples, as well as the field of activity of the company/companies analyzed.* For studies to be relevant and generate valid results, it is essential to clearly identify the research populations and their corresponding samples.
- *Establish the methods of collecting and analyzing data used in the analysis of sustainable business models.* To obtain accurate and relevant information about the sustainability of a business model, it is essential to apply rigorous methods for both data collection and analysis. Among the most widely used methods and those that we expect to be applied are quantitative methods, which include standardized questionnaires, statistical surveys, analysis of existing databases and numerical evaluation of specific indicators (benchmarking). Qualitative methods are also frequently used, such as semi-structured interviews, focus groups, in-depth case studies, thematic analysis of documents and direct observations. In practice, however, it is often recommended to use mixed methods, so a combination of quantitative and qualitative approaches, to provide a comprehensive and validated perspective on the results obtained.
- *Identify the existence of a template for a sustainable business model.* Such a template generally includes the essential structural components of a business model, such as the value proposition, customer segments, distribution channels, strategic partnerships, key resources and cost structure, in which sustainability principles are explicitly integrated into each element. The template also contains clearly defined indicators and objectives, which allow for the accurate and constant assessment of the company's sustainable performance. In addition, it provides clear instructions and procedures for the implementation, monitoring and periodic adjustment of sustainable initiatives, thus facilitating a coherent and effective approach to sustainability within the organization.

2. Research methodology

The bibliometric research methodology proposed in this paper emphasizes a qualitative approach, specifically focused on the analysis of the content of the papers, in the context of case studies on sustainable business models.

Initially, data collection was guided by the usual research procedures that fit the context of bibliometric analysis through the search engine Google Scholar and ISI Web of Science/Clarivate (WoS). A systematic and iterative search was performed on these databases. This procedure is performed to assess the validity of the dataset and to guarantee the reliability of the collected data.

Our database was also enriched by manually searching for authors in these academic platforms. Regarding the sampling and screening process, in the selection of publications we consider four factors: the context of the paper; monitoring the citations of relevant articles; the publication period because priority is given to current publications; compatibility with our study context.

In the next stage, our research approach continues with the process of extracting data from the specialized literature, using the academic platforms mentioned above. The goal of this stage is to ensure the most comprehensive coverage of contemporary scientific journals, giving priority to high-quality publications, from which relevant information can be obtained for the bibliometric analysis of case studies dedicated to sustainable business models.

The data collection strategy for this analysis is as follows: search for the topic "case study on sustainable business models", "sustainable business models case studies", and "a review of sustainable business models case studies"; time frame 2020–2024; Google Scholar and ISI Web of Science (WoS)/Clarivate databases.

Stage 1: Material collection

The articles are identified in the Google Scholar & Web of Science databases using the search terms "case study on sustainable business models", "sustainable business models case studies", "a review of sustainable business models case studies".

Google Scholar	Web of Science
134	122

Stage 2: Displaying articles

Research methodology:

Selection criteria: Academic publications; declaration of the authors of the articles; Frequency of citations; Their adherence to the specific topic that includes case studies; Time interval=2020–2024.

Exclusion criteria: Exclusion of duplicate documents and those that are not written in English. Exclusion of articles that are part of other fields or do not correspond to the researched topic.

Remaining documents = 159.

Stage 3: Analysis, synthesis and storage of information / Filtering by title and keywords

Extracting and studying relevant works that are suitable for bibliometric analysis; Selecting and studying the selected works; Manually locating highly cited and more influential works; Identifying the elements necessary for our study.

Remaining documents = 102.

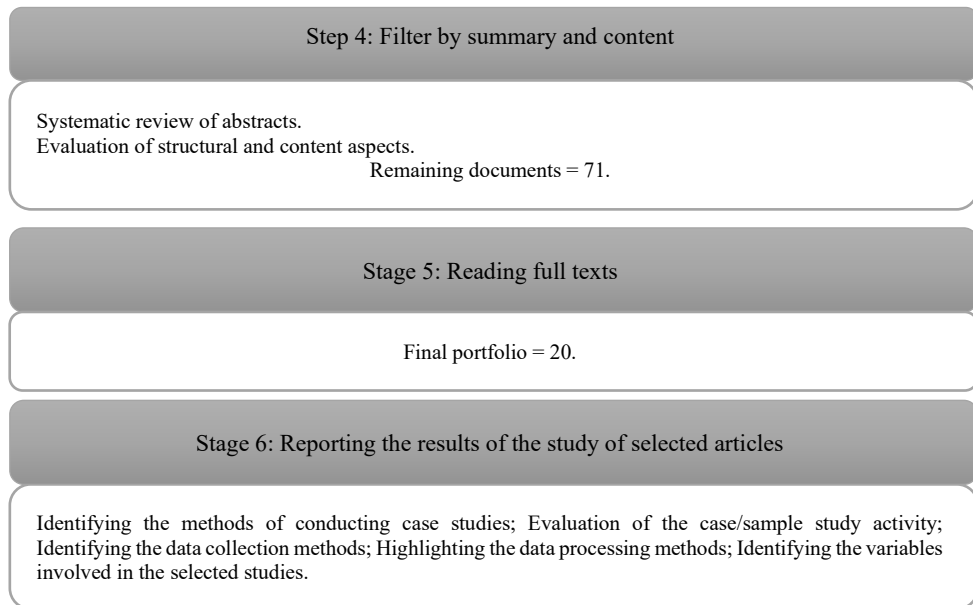


Figure 1: Literature review methodology, inclusion/exclusion criteria and article selection

Source: created by the author

A total of 20 publications were extracted from the literature materials for close analysis. See the figure above.

To ensure the accuracy and validity of the results, we considered it necessary to make a manual selection, both in terms of merging data and eliminating duplicate data. This selection was preferable to be done manually, because the context of our study includes strict aspects, so only those case studies that were carried out on sustainable business models. In this manual selection, we took into account, among other things, the authors' statements extracted from the abstracts of the analyzed articles. Our preference refers specifically to the content of their proposals, paying close attention to whether the article proposes or presents a model, conceptual framework, method or tool, as well as valid and relevant results for our bibliometric analysis. Content analysis was used to carry out the data synthesis procedure. In itself, "this analysis consists of a set of techniques for systematic examination of texts, which can be applied qualitatively and quantitatively to evaluate structural (descriptive) and content aspects" (Kurek et al., 2023: 5).

3. Data collection, structuring and interpretation of selected studies

After selecting the relevant papers for our study, we conducted an additional assessment, targeting the case study design methods. This analysis exclusively

considered the field of activity of the case study/sample, the methods of data collection and processing, as well as the variables involved in the case studies on sustainable business models, each of which was subsequently associated with relevant explanations. Because bibliometric analysis allows for iterative research, specific aspects of the case studies were investigated through systematic and detailed review.

Table 1: List of selected articles.

Number of articles	Article title/Study topic	Authors/year
1	Sustainable business modeling: The need for innovative design thinking	He, Ortiz, 2021
2	Value of Sustainable Business Model in Mining Company: A Case Study	Sinansari, Putri, Lopatka, 2022
3	Sustainable business models of small and medium-sized enterprises and the relationships to be established within the supply chain to support these models	Macchion, Toscani, Vinelli, 2023
4	Analysis of Sustainable Business Models: Exploratory Study in Two Brazilian Logistics Companies	Gomes, et al, 2022
5	Small and medium enterprises and sustainable business models: Exploring enabling factors for adoption	Troise, Santoro, Jones, Bresciani, 2024
6	The Interactions between a Sustainable Business Model and Scalability: A Case Study	Biscaro, 2023
7	Sustainable Business Model Based on Digital Twin Platform Network: The Inspiration from Haier's Case Study in China	Li, Cao, Liu, Luo, 2020
8	Sustainable business model design: A multi-case approach exploring generic strategies and dynamic capabilities on the example of German Wine Estates	Dressler, 2023
9	Sustainable Business Model Innovation in the Furniture Supply Chain: A Case Study	Shlopak, Nujen, Halfdanarson, 2020
10	How smart technologies can support sustainable business models: insights from an air navigation service provider	Fiorentino, Grimaldi, Lamboglia, Merendino, 2020
11	Sustainable business model innovation: The role of boundary work for multi-stakeholder alignment	Velter, Bitzer, Bocken, Kemp, 2020
12	Designing and testing a new sustainable business model tool for multi-actor, multi-level, circular, and collaborative contexts	Boldrini, Antheaume, 2021
13	Remanufacturing with upgrade PSS for new sustainable business models	Copani, Behnam, 2020

14	The “milky ways”: emerging sustainable business models for sustainable value creation in the dairy industry	Cantele, Signori, 2023
15	Drivers to implement the circular economy in born-sustainable business models: a case study in the fashion industry	Ostermann, Nascimento, Steinbruch, Callegaro-de-Menezes, 2021
16	Digital sustainable business models: Using digital technology to integrate ecological sustainability into the core of business models	Böttcher, Empelmann, Weking, Hein, Krcmar, 2024
17	Unpacking sustainable business models in the Swedish agricultural sector - the challenges of technological, social and organisational innovation	Barth, Ulvenblad, Hoveskog, 2021
18	Frugal innovation and sustainable business models	Hossain, 2021
19	Drivers of sustainable business model innovations. An upper echelon theory perspective	Dhir, Khan, Islam, Ractham, Meenakshi, 2023
20	Sustainable business model innovation: Scale development, validation and proof of performance	Bashir, Alfalih, Pradhan, 2022

Source: created by the author

Economic sustainability appears as an implicit aspect in almost every one of the articles studied and aims at the ability of the business model to ensure stable revenues, competitive advantage and long-term financial viability, including cost optimization and generating constant revenues through sustainable practices (He&Ortiz, 2021; Sinansari et al., 2022; Macchion et al., 2023; Gomes et al., 2022; Troise et al., 2024; Biscaro, 2023; Li et al., 2020; Dressler, 2023; Shlopak et al., 2020; Fiorentino et al., 2020; Velter et al., 2020; Boldrini&Antheaume, 2021; Copani&Behnam, 2020; Cantele&Signori, 2023; Ostermann et al., 2021; Böttcher et al., 2024; Hossain, 2021; Dhir et al., 2023; Bashir et al., 2022).

Ecological sustainability refers to reducing environmental impacts by adopting practices such as organic farming, reusing materials, using renewable sources, recycling, and reducing energy consumption and pollution.

Social sustainability includes social responsibility, promoting transparency, increasing consumer trust, and improving social and labor standards.

A sustainable business model involves a sustainable approach to the three pillars of business: value proposition, value creation, and value capture. The value proposition is the value that companies promise to deliver to customers. Value creation refers to the processes and methods by which businesses produce value using local materials, cheap resources, simple technologies, and innovative solutions to reduce production costs and provide affordable products to customers with limited resources. These companies use local or recycled materials and simple technologies to provide sustainable solutions that meet specific local needs, while also contributing to job creation. Value capture is how companies generate revenue and profit from the products they create. Value capture is also achieved by using alternative distribution

channels, collaborating with local institutions, and obtaining informal and formal support, including promotion through unconventional media and media

Innovation in sustainable business models involves developing new products and services, adapting quickly and flexibly to market changes, using feedback and continuous iteration for improvement, implementing smart technologies, and developing dynamic capabilities for organizational transformation.

Sustainable models use extensive collaboration and co-creation with stakeholders, including customers, suppliers, partners, institutions, and local communities to increase efficiency, transparency, and value created in value chains.

The feedback constantly collected from customers and other stakeholders is used to continuously optimize the sustainable business model and adapt it to market and consumer demands, contributing to economic, social and ecological performance.

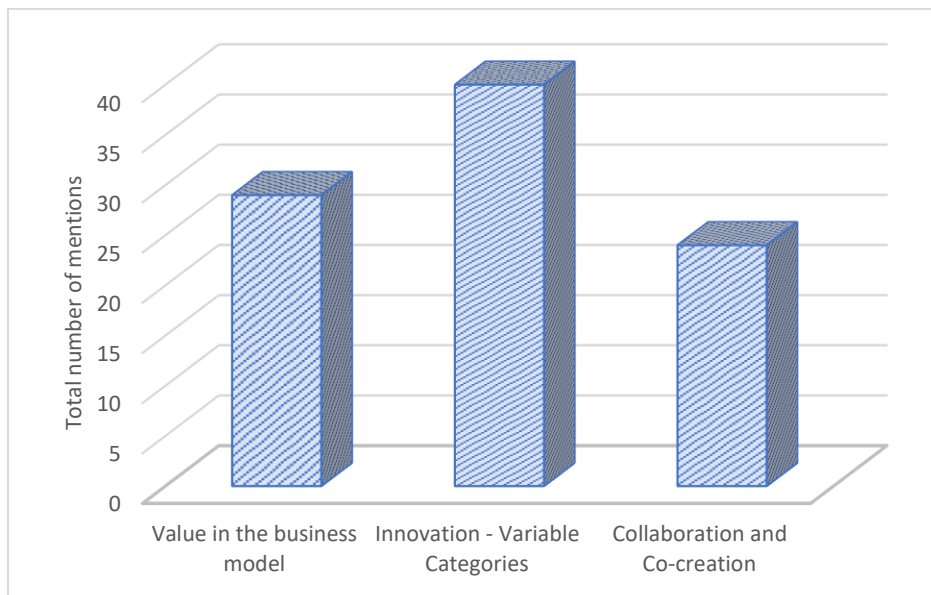


Figure 2: Aggregated summary of mentions in the main categories (Value in the business model, Innovation, Collaboration and Co-creation)

Source: created by the author

The conclusion of the studies analyzed is that sustainable business models focus on proposing, creating, capturing and delivering value through product and service innovation, adapting value propositions to consumer demands and developing efficient and transparent value chains based on collaboration.

4. Interpretation of results. Discussion and final observations

This research presents a bibliometric analysis of case studies on sustainable business models during the period 2020-2024. Below we will mention the defined objectives of the bibliometric analysis and the results obtained for each of the objectives.

- *The dimensions that formed the basis for the assessment of a sustainable business model.*
- *The extent to which indicators are used to quantify these dimensions.*
- *The type and quantity of research populations used as samples, as well as the field of activity of the company/companies analyzed.*
- *The methods of data collection and analysis.*
- *The existence of a template for a sustainable business model.*

Dimensions that formed the basis of the assessment of a sustainable business model.

The bibliometric analysis based on the review of the specialized literature in the specific case builds a five-dimensional framework of a sustainable business model and analyzes the association and causal relationship between the dimensions, as well as between the configuration of the elements that make up each of these dimensions. According to the results obtained from the bibliometric analysis, research on sustainable business models focuses mainly on considering the economic, social, ecological, organizational and technological benefits (dimensions).

The extent to which indicators are used to quantify these dimensions. Referring to our study on conducting the bibliometric analysis, the term “sustainable” does not only refer to the environmental or technological impact, but also to the economic, social and organizational effects that the company must address as a whole. Some aspects of business sustainability are not easy to measure, because some data are considered latent, somewhat quantitatively imperceptible and therefore cannot be measured immediately. For this reason, it is important to identify indicators that produce clear data that can be measured by specific tools and then subjected to the necessary analyses for interpretation. In this context, referring to the empirical studies of the 20 authors whose articles are included in this bibliometric analysis, it is important to highlight the main indicators that were used to measure the sustainability of the companies studied by them. Although there are a number of different methods for quantifying and assessing business model sustainability, there are still various obstacles to clearly defining the balance between economic success, ecological protection and social responsibility. He, Ortiz (2021, p.4) used Research Theory in combination with: Transaction Cost Theory, Resource-Based Theory, Resource-Dependent Theory, Dynamic Capacity Theory, Social Capital Theory and Value Chain Theory.

The type and amount of research populations used as samples, as well as the field of activity of the analyzed company/companies. Qualitative and quantitative research methods can be based on small or large samples depending on the objectives, the type or amount of data collected and the analysis approach used (Cash et al., 2022, p.10). In accordance with the research purpose, Macchion, et al., (2023), decided to include in the acceptance criteria for the sample: (1) small and medium-sized enterprises; (2) these enterprises must represent successful cases in the implementation of sustainable business models. The case companies were identified in different sectors such as: Advertising materials, Luxury leather goods, Wine producers, Packaging materials. Dressler (2023) conducted a multiple case study in the field of wine production, using as a sample: a cooperative composed of many small winegrowers; a

very small, family-owned, relatively young and growing winery; a largely sustainable state winery; a private winery that belongs to the premium wineries. He, Ortiz, (2021) set as selection criteria a company that is on the path of sustainable business innovation; that shows interest in configuring the logic of entrepreneurship and that is prone to co-research as an active participant with other market actors. Thus, the authors of He, Ortiz (2021) selected a company that operates as an e-commerce for fresh food products. Sinansari et al., (2022) selected as a sample a company that proves to be one of the most important suppliers of ecological minerals for the construction and energy industries. Gomes, et al, (2022) selected as a sample two companies that are in a mergers and acquisitions process. The sample used by Troise et al., (2024), consists of 36 small and medium-sized enterprises that have reconfigured their business models and adopted a sustainable business model. Two other selection criteria were the context and size of the enterprise. The companies were from different sectors: Manufacturing; Services and utilities activities; Wholesale and retail trade; Food and beverages; E-commerce and social networks; ICT, software; Finance, insurance and banking activities. Biscaro (2023) used as a sample a company that had a sustainable business model and was going through a scalability phase. The scalability dimension was studied in the context of increasing model capabilities in the automotive sector. Li et al., (2020) selected as a sample a company that made the transition from a single product to a full set of smart solutions. The studied sector coincides with the eco-innovation domain in the manufacturing industry of major smart home appliances. The company selected as a sample for the study by Shlopak et al., (2020) is a retailer of office furniture for SMEs, is locally owned and mainly serves customers operating in its region. The scope of the study is the manufacturing industry in the furniture sector along the supply chain. Fiorentino et al., (2020) used as a sample a company operating in the market as an air navigation service provider to explore how this firm uses smart technologies to successfully create its sustainable business model. The sample selected by Velter et al., (2020) includes 9 companies for the study that correspond to the manufacturing industry from different sectors such as: construction sector, carpet production; agricultural and energy companies; horticultural development sector; raw material processing; retail sales; art; equipment installation and marketing. Boldrini et al., (2021) selected 9 companies for the study from the innovation industry for plastic films designed to protect horticultural crops. The sample chosen for the study by Copani et al., (2020) corresponds to a detailed analysis of 19 companies pioneering remanufacturing from different sectors such as: phone and laptop service providers; aerospace-related product/service offerings. The study by Cantele et al., (2023) uses as a sample 7 agri-food companies in the dairy sector (butter, milk, yoghurt, typical fresh and aged cheese and other products such as ice cream and plant-based drinks). Ostermann et al., (2021) selected as a sample a company in the fashion industry that implemented circular practices, defined by a sectoral commitment. Böttcher et al., (2024) used a sample of 31 start-up companies to understand how ecological and economic sustainability is achieved thanks to the implementation of digital business models. Barth et al., (2021) used a sample of 1143 companies to study innovation in the agri-food industry. Hossain (2021) used a sample of 3 firms to study frugal innovation in the manufacturing industry of various machines. Dhiri et al., (2023) used a total of 20 firms as a sample to understand the integration of innovation within manufacturing firms in various sectors (automotive, food and beverage, industrial

consumables, textiles & clothing, electrical & electronics, etc.). Bashir et al., (2022) used a sample of 330 firms corresponding to various manufacturing and service companies with a priority orientation towards the local market, while a small part of them has a global and regional market orientation.

Methods of data collection and analysis. Bibliometric analysis showed that data were collected from different audiences in different periods of time. They range from simple surveys to more complex quantitative or qualitative experiments. Data collection methods include a variety of techniques and tools for collecting quantitative and qualitative data. In general, data collection methods are divided into two main categories: primary data collection methods and secondary data collection methods. Referring to the empirical research studied above, it is observed that the following primary data were used: questionnaires, interviews (structured or semi-structured), observation, survey, experimental method. So, in most empirical studies we observe that the authors opted for the development of surveys, interviews, existing databases were investigated and observational data were accumulated, considering these methods as appropriate approaches for data collection and management. Secondary data collection methods from internal and external data sources were also used for organizational data from published sources, online databases and publicly available data. After analyzing the collected data, of particular importance is the interpretation and presentation of the findings by the authors. Also, the interpretative structural modeling (ISM) method of stratifying and organizing the data accumulated from multiple sources and presenting a regular structural relationship was considered by the authors as a valuable tool for objective interpretations as close as possible to the reality of the firm. Also, regarding data analysis as one of the most important processes in obtaining reliable results, we emphasize that in some cases the data collected by the authors were compared with the theories studied, selecting the best practices in each field and planning and building new scenarios for companies. So, we note that the authors implemented different types of approaches to treat the case study / multiple case studies in research, among which we cite: descriptive, exploratory / comparative exploratory, experimental, structural, explanatory, abductive, inductive approaches, as well as Interpretative Structural Modeling (ISM).

The existence of a sustainable business model template. Since the Business Model Canvas (BMC) was first developed around 2008 and up until now in the contemporary environment, we highlight that many new versions have been created and more complex approaches have created more comprehensive scenarios for business models. New research has interpreted complete design systems that allow the inclusion of more specific steps from which the economic, social and environmental benefits of the business model can be determined. The Sustainable Business Model Canvas (S-BMC) is a new trend and a critical tool for startups and enterprises that aim to incorporate environmental and social objectives alongside economic ones into their core business model operations. The purpose of this paper coincides with the interpretation of several objectives. The fifth objective is developed “by identifying the currently perceived dimensions of corporate sustainability and business models; given that generic business model templates for corporate sustainability issues are scarce and that this gap still needs to be filled with critical analysis to move from rhetoric to a generic template for business models for sustainability” (Lüdeke-Freund, 2009: 3). To expand the list of classic components of the Business Model Canvas (BMC) and “to

capture new practices in this field, several archetypes of sustainable business models have been developed and classified according to several technological, social and organizational types" (Gomes et al., 2022: 5). "To illustrate sustainable business models, various elaborations have emerged in recent years, such as the flourishing screen by Jones and Upward in 2014", which Gomes et al., (2022: 6) bring back with the relevant configurations. In this context, an example of this screen from the sustainable business model canvas is implemented as an appropriate template to obtain valid analysis results. Thus, three archetypes are included in the conceptual business model of Osterwalder and Pigneur. In the structure of the value proposition, the elements of profit, people and planet appear as a holistic and necessary approach to face the challenges of a sustainable future. This approach focuses on environmental change alongside economic and social change. In this sense, sustainable business models use a triple bottom line (people, profit, planet) to measure company performance, in addition to promoting environmental management in a systematic way. This template creates valuable information for interpreting business growth prospects.

5. Conclusions

In addition, the bibliometric analysis highlighted other useful aspects for the empirical research we propose:

- Research has shown that sustainability is an increasingly important feature in business. Transforming the business model into a sustainable model refers to the coherent development of economic, social and environmental sustainability. In some respects, it is argued that further integration of the principles of technological and organizational sustainability is necessary.
- The need for innovative design thinking helps to develop a more reliable sustainable business model. Thus, encouraging innovation in all dimensions of industrial activities can be achieved by updating or reconfiguring business elements and resources in a consistent coherence with the challenges of the future.
- Understanding the perception of the proposition or value creation is one of the main objectives of incorporating sustainable business model innovation.
- There is a close relationship between corporate social responsibility and environmental performance in the context of sustainable development.
- The efficiency of the entire information collection system from different subjects helps the business model to have the right approach to performing more in-depth data analysis. In this way, the realistic perception of the model regarding the evaluation of available information materials increases, the possibility of creating the necessary content filters increases and only those results that should be included in the implementation of sustainability practices can be incorporated with full subjectivity.
- Thus, the tendency to move from the classic model to a sustainable one is often highlighted. This phenomenon is related to the contribution derived from the use of digital IT, Internet of Things, electronic procurement, big data analysis, blockchain or artificial intelligence technology. This allows companies to

centralize and transform large amounts of raw or unstructured information into rules, valuable instructions, decisions and subsequently profits.

- Examining above the case studies of 20 authors in a variety of contexts and with different organizational forms, we note that several different types of sustainable business models can be distinguished. Mignon et al., (2023: 1365) proposes four different types of sustainable business models that are considered as such when complementary features are added to the traditional model in different contexts of sustainable improvement: (1) which involve improvements towards efficiency, (2) are based on new ways of doing business sustainably, (3) which have a stronger orientation towards society and/or the environment or (4) which are born sustainable. Referring to our research this data set validates our results. In the context of our study, these business models are considered sustainable because compared to classic (traditional) business models, they: (1) involve improvements in terms of logistical efficiency and coverage of the entire value chain system; (2) promotes new ways of transforming the model, by introducing new elements that completely transform the features of the business model and project the transition from one model to another; promotes the modification of the model by introducing additional business models at the root of the current model; is the replica of a metamorphosis of the model by acquiring a new business model; (3) refers to a more pronounced coherence of cooperation towards society and/or the environment; (4) suggests sustainable start-ups by creating and developing a completely new business model that is to develop on favorable perspectives and resistant to future entrepreneurial trends. Therefore, the analysis carried out by us above is validated by the data set proposed by Mignon et al., (2023). Therefore, the flexibility and agility of the model is encouraged, which can be proven by the rapid adaptation of the model to market requirements.
- The above analysis has shown that companies have different tendencies, perceptions and tools regarding the implementation of innovation within sustainable business models. The dimensions in which these companies project innovation correspond to concepts that differ from one company to another. The results presented indicate that different companies may have certain common elements in the perception of innovation, but these similarities appear only at a low level, being rare and/or partial. Overall, the study highlights a significant diversity of the innovative techniques used.
- At the same time, some models facilitate the transition from traditional approaches to sustainable ones more effectively. This depends on the extent to which these models manage to offer personalized products or services, better adapted to the individual requirements of customers. To achieve this objective, companies often use technology combined with social and environmental responsibility as stimulating elements.
- Researching the context of the works studied above showed that almost all models envisage transforming or have already transformed the traditional consumption processes according to which products, after being consumed, are thrown away. Meanwhile, practices are being implemented that increase the responsibility of the company first and the consumer second. This is achieved by transforming the entire system as a closed loop according to which

used products are subsequently subjected to recycling. This initiative not only protects the ecosystem as a whole, but also helps companies by reducing the total cost of resources and, at the same time, saves the use of resources in more responsible proportions.

- As companies demonstrate a strong societal or environmental focus, they often employ a variety of supply chain and collaboration strategies, such as partnerships, co-ownership, formal or informal alliances with stakeholders, close cooperation with suppliers, financial institutions and educational institutions, the involvement of employees, customers, investors and other relevant entities, or the development of long-term agreements. When companies establish and communicate a clear sustainability ambition or vision, they can simultaneously go beyond the traditional boundaries of their business model and generate new perspectives. Thus, by increasing cooperation with different stakeholders (society at large), companies benefit from a greater opportunity to share new ideas and create innovative perspectives. As a result, complementary capability transfers based on reciprocity can occur. By paying increased attention to stakeholders, both consumers and the company or other actors involved can benefit from shared advantages that contribute to mutual value creation.

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TOWARDS A BUSINESS MODELS CLASSIFICATION

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Abstract: *In the contemporary environment, companies are configured not only as traditional economic actors, but as veritable nodes of intermediation of ideas and creations, capable of articulating new forms of value and competitiveness in a context marked by complexity and volatility. This study systematically addresses the conceptual differences between typologies and taxonomies in business models, leveraging the comparative analysis of various business model archetypes to establish an innovative typology of business models, capable of providing a coherent framework for classification and strategic development. The methodology used in this paper involves the analysis of business models, focusing on existing essentialist perspectives, with the aim of identifying and understanding the fundamental characteristics that shape the diversity of business models discussed in the specialized literature. Based on these observations, this study aims to answer two essential research questions: How can essentialist and empirical classification reveal the fundamental structures of business models? To what extent can these classifications, combined with the investigation of the main categories of business models, lead to the proposal of a typology for them? This analysis aims to propose a new typology, which provides a clear framework for framing the different business models.*

Keywords: *business models; business model typology; business model taxonomy; classification framework; innovative typology.*

JEL classification: *M10; M19; L20*

1. Introduction

The paper explores the specialized literature through a descriptive-analytical approach, aiming to examine relevant studies regarding taxonomies, typologies, and types of business models, with the intention of identifying the conceptual foundations that can underlie the development of a new typology capable of providing a coherent framework for classification and strategic interpretation of them.

The analysis of these theoretical contributions allows for understanding how the various structural, functional, and contextual perspectives have shaped the evolution of existing classifications.

Schoormann (2023:6) highlights the relevance of research on taxonomies and typologies, emphasizing the variety of ways in which they are developed, communicated, and integrated into theoretical and practical processes, an aspect that underlines the necessity of a rigorous and innovative approach in defining the

classification frameworks of business models. In this context, the present paper aims to contribute to the consolidation of the conceptual foundation of the field through a comparative and critical analysis of the specialized literature.

2. Conceptual perspectives on business model taxonomies, typologies and classification

Bailey (1994) emphasizes the fundamental difference between typologies and taxonomies, highlighting their distinct nature. Typology is based on theoretical concepts, each element representing an ideal model that helps in understanding phenomena at an abstract level. In contrast, taxonomy is anchored in empirical data, transforming concrete observations into verifiable classifications. Thus, typology provides the theoretical framework that guides interpretation, while taxonomy supplies the necessary empirical support, and together they allow a complete and balanced understanding of the studied phenomena.

The fundamental difference between typologies and taxonomies lies in the nature of the approach: typologies are conceptual and qualitative, whereas taxonomies are empirical and quantitative (Lüdeke-Freund et al. 2018:14).

Although there are notable differences between typologies, taxonomies, and classifications, the terms are often used somewhat carelessly, both in practice and in scientific literature. Table 1 presents a partial synthesis of the classification of business models, with the caveat that even here the term “classification” is used interchangeably with “taxonomy” or “typology.”

Another term used in organizing types of business models is classification. Classification differs from taxonomy and typology in that it represents a general form of organizing objects based on shared characteristics, while taxonomy is an empirical, inductively constructed classification that groups real-world instances according to observable similarities, and typology is a theoretical, deductively constructed classification that defines ideal or conceptual types derived from existing theoretical foundations.

Kamprath and Halecker (2012) propose a systematic approach for classifying business models at the industry level, using taxonomy methods to operationalize and compare large quantities of models through a four-dimensional grid applied to companies in the personalized medicine sector, thus offering a strategic tool for analysis and innovation. Also, Schoormann et al. (2023) conduct a comprehensive comparative analysis of existing classification tools (typologies, taxonomies, and classification schemes), highlighting conceptual and methodological differences among them and providing an analytical framework for the rigorous design of new business model classification tools. Groth and Nielsen (2015) propose a methodological research design for creating valid and reliable business model taxonomies using statistical methods such as cluster analysis and latent class analysis, emphasizing the need for large-scale empirical studies to underpin such classifications. Lambert (2015) underscores the importance of classification in business model research and proposes a structured method for designing classification schemes, arguing that rigorous taxonomies can accelerate theory building in this emerging field. Möller et al. (2021) synthesize insights from information systems research to guide the design of empirical business model taxonomies, analyzing their diffusion across industries and technologies and offering

methodological recommendations for future taxonomy design studies. Finally, Weking et al. (2018) develop a hierarchical taxonomy of business model patterns based on recurring successful configurations, structuring 194 elements identified in the literature into a hierarchy of generalizations and specializations that facilitates business model innovation and reduces the complexity of the design process.

Table 1: Overview of Business Model Classification Approaches

No.	Authors / Year	Main Focus / Contribution	Type of Classification Proposed
1	Kamprath & Halecker (2012)	Develop a systematic approach to compare and classify large numbers of business models in an industry context, integrating system thinking and activity system perspectives.	Four-dimensional business model taxonomy grid based on nine components, 27 indicators, and 132 characteristics (applied to Personalized Medicine).
2	Lambert (2015)	Emphasizes the importance of rigorous classification for theory building in business model research and proposes a structured process for classification design.	General classification design method for business model research - integrates conceptual and empirical classification logic (typology vs. taxonomy).
3	Groth & Nielsen (2015)	Present a research design ("recipe") for constructing reliable taxonomies using empirical methods and statistical clustering techniques.	Empirical business model taxonomy framework based on cluster analysis and latent class analysis for grouping firms by business model similarity.
4	Weking, Hein, Böhm & Krcmar (2018)	Build a hierarchical taxonomy of business model patterns to structure 194 recurring configurations that support business model innovation.	Hierarchical taxonomy of business model patterns, organizes generalizations and specializations based on inheritance among business model elements.
5	Möller, Stachon, Azkan, Schoormann & Otto (2021)	Synthesizes existing research to identify how taxonomies are designed across industries and technologies; provides guidance for empirical taxonomy construction.	Design framework for empirical taxonomies, identifies design dimensions (context, method, visualization, iteration) and maps taxonomy diffusion by sector/technology.
6	Schoormann, Schweihoff, Jussen & Möller (2023)	Provide a meta-analysis of classification tools (typologies, taxonomies, classification schemes) and a	Analytical grid for classification tools - distinguishes and compares taxonomy,

		framework for understanding their conceptual and methodological foundations.	typology, and classification scheme according to design principles and use contexts.

(Source: created by authors)

3. Methodology: a systematic approach for business models classification development

The purpose of the research is to achieve a classification of existing business models in the specialized literature. The objectives that are subordinate to this purpose are to identify existing business models (at least the best-known ones) and then find some classification criteria that meet the methodological and epistemological requirements. The working method consisted of the systematic analysis of business models presented in the specialized literature. The design of research is presented in Figure 1. We chose Google Scholar as the database due to the large number of works and chose a single database to avoid overlaps. The time interval of the research articles was a wide one, starting with the year 2000, the working method was based on Grounded Theory (Glaser, Strauss, 1998). The search interval was 2000-2024 and resulted in 57,800 articles that have the term "business models" in the title and abstract. The articles were listed according to the frequency of access, the number of citations being linked to the frequency of access. The results were consulted and only the articles that present a business model not found in the previous articles were selected. In the next stage, an inventory of these models and their characteristics was made.

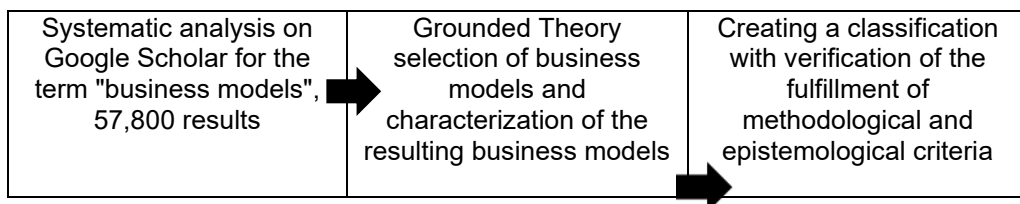


Figure 1: Research design
(Source: created by authors)

Following the analysis of the Google Scholar database, 16 business models were identified, for which a series of characteristics were presented in Table 2. A valid classification must meet several essential criteria to ensure its scientific rigor, clarity, and usefulness (Bailey, 1994; Lambert, 2015; Groth, Nielsen 2015). It should be comprehensive, meaning it must include all relevant categories that adequately represent the studied phenomenon, and mutually exclusive, so that each object belongs to only one category without conceptual overlap. The classification must also be exhaustive, ensuring that every instance can be classified within its structure, and clear,

with well-defined, transparent classification criteria that allow replication by other researchers. Logical consistency is required so that the relationships among dimensions and categories follow a coherent and non-contradictory rationale. Moreover, a good classification must be useful, serving analytical or practical purposes such as comparison, evaluation, or innovation. Empirical robustness is another key requirement, as the classification's categories should be validated through data analysis or theoretical justification. Simplicity and parsimony are equally important, as the number of dimensions and classes should capture the phenomenon sufficiently without unnecessary complexity. Finally, stability and extendibility ensure that the classification remains valid over time but can also adapt to new developments or emerging categories.

Table 2: Characteristics of business models identified in the literature

Business model name	Characteristics of business model
Retailer business model	Value creation for customers; Adaptability to market changes; Variety of sales formats (physical, online, hybrid); Operational activities; Interdependent governance structures; Digital expansion; Direct-to-consumer through digital platforms, flagship stores, and shop-in-shop concepts (Prepletaný, 2013; Haas, 2019).
Manufacturer business model	Customer embedded in operational and engineering flows; Alignment of production with business activities through evolutionary manufacturing; Evolutionary manufacturing synchronizing production and commercial activities; Distribution remains separate (Browne et al. 1995).
Subscription business model	Perceived value and relevance of the service; Beliefs about transaction fairness; Attitudes toward paying for previously free services; Ease of access; Importance of the service; Additional benefits; Perceived standard; Usage frequency; Perceived fairness; Perceived security risks (Wang et al. 2005).
Bundling business model	Integration of products and services into a single offer; Preferential pricing; Increased accessibility for previously untargeted customer segments; Price differentiation opportunities; Optimization of commercial expenses; Strengthened competitive positioning; Creation of entry barriers for potential competitors (Dominique-Ferreira et al. 2020).
Product-as-a-service business model	Combined package of products and services; Economic, social, and ecological sustainability; Focus on satisfying customer requirements and needs (Annarelli et al. 2016).

Leasing business model	Goods rented instead of purchased; Ownership retained by the manufacturer (Browne et al. 1995).
Franchise business model	Franchisor grants the right to use a brand or trade name; Operations governed by predefined terms and conditions (Lee et al. 2016).
Distribution business model	Optimization of distribution channels; Reexamination of post-sale services; Adjustments for economic efficiency; Strategic reconfiguration for financial sustainability (Loomba, 1996).
Freemium business model	Provision of free services to users; Reduction of access barriers; Attraction of a larger audience compared to paid-only models (Voigt et al. 2016).
Advertising or affiliate marketing business model	Promotion and sale of products or services through external channels; Transmission of relevant information to customers; Focus on generating online transactions; Earning commissions for affiliate partners (Patrick et al. 2021).
Digital business models	Transformation of operational structure through digital technologies; Strategic integration of digital technologies; Development of innovative business models, operational flows, software systems, and digital infrastructures; Increased profitability; Strengthened competitive advantage; Optimized organizational efficiency (Veit et al. 2014; Schwertner 2017).
Platform business model	Value derived from reciprocal and collaborative interactions among participants; Co-creation processes; Continuously adapting platform structure and governance; Adjustment to participant activities and network behaviors; Responsiveness to network requirements (Fehrer et al. 2018).
Big-data business models	Value generated through advanced processing and analysis of data; Transformation of raw data into actionable insights; Creation of innovative products and services; Significant impact on organizational decision-making and performance (Davenport et al. 2013).
Circular economy business models	Adoption of innovations to generate and capture value; Strict adherence to circular principles; Alignment of internal processes and strategies with circularity; Coordinated collaboration with stakeholders; Simultaneous economic, social, and environmental benefits; Long-term sustainability (Lahti et al. 2018).
Canvas business model	Analytical and visual tool; Identification and examination of fundamental business model components; Clear mapping for organizing and

	documenting essential details; Facilitation of understanding and strategic business planning (Osterwalder and Pigneur, 2010; Carter et al. 2020).
Sustainable business models	Integration of eco-innovations; Promotion of ecological efficiency; Implementation of corporate social responsibility practices; Definition of sustainability priorities and strategic directions (Bocken et al. 2014).

(Source: created by authors)

Highlighting the diversity of types of business models constitutes a solid basis for a relevant comparative analysis, which emphasizes both their differences and complementarities, particularly with regard to sustainability, innovation, modularity, and social/ecological impact, thus reflecting the significant variety of approaches to adaptability in the context of a dynamic market. The comparative analysis includes a wide range of business models, such as the retailer model (Prepletaný 2013; Haas, 2019), the manufacturer model (Browne, et al. 1995; Kiel, et al. 2017), subscription (Wang, et al. 2005; Oat, 2013), bundling model (Dominique-Ferreira et al. 2020; Madhavaram, et al. 2023), product-as-a-service business model (Annarelli, et al. 2016), leasing model (Browne et al. 1995; Kuo, et al. 2019), franchise model (Lee, et al. 2016; Baresa, et al. 2017), distribution model (Loomba, 1996; Castaneda, et al. 1998), freemium (Voigt et al. 2016; Rietveld, 2018), advertising or affiliate marketing business model (Brown, 2009; Patrick et al. 2021), digital models (Veit et al. 2014; Schwertner 2017; Kotarba, 2018) and platform business models (Fehrer et al. 2018; Zhao, et al. 2020), big data models (Davenport et al. 2013; Schroeder, 2016), circular economy business models (Lahti et al. 2018; Kalmykova, et al. 2018), Canvas business model (Osterwalder, Pigneur, 2010; Carter et al. 2020; Perciun, et al. 2022) and sustainable business model (Schaltegger, et al. 2011; Bocken et al. 2014; Gauthier, et al. 2016), each highlighting essential particularities regarding sustainability, innovation, modularity, and social impact. Traditional models, such as the retailer and manufacturer models, emphasize optimizing the value chain and adapting to competitive changes, but they integrate sustainability and social responsibility aspects to a limited extent. In contrast, modern models, such as those based on the circular economy and sustainable models, explicitly incorporate ecological, economic, and social principles, promoting innovation through resource reuse and reducing environmental impact. Digital models, platforms, and big data-based models stand out for their modularity and high adaptability, facilitating co-creation of value and rapid response to market changes. At the same time, product-as-a-service and leasing models reflect a strong commitment to sustainability by extending product lifecycles and promoting responsible consumption. Social impact is emphasized in models that include corporate social responsibility and eco-innovations, integrating ethical dimensions into business strategy. In conclusion, these typologies provide a comprehensive framework for understanding and applying sustainability in the design and implementation of innovative, flexible, and socially and ecologically responsible business models. This theoretical foundation serves as a starting point for further exploration of business models, highlighting how the distinct characteristics of archetypes can guide the process of innovation and the integration of social responsibility and economic efficiency principles into organizational practices.

4. Proposing a classification of business models

The analysis of the business model is oriented toward identifying and understanding the fundamental archetypes that structure the diversity of business models existing in the specialized literature. The importance of careful selection of these archetypes is emphasized, a process that involves not only their formal classification but also an examination of the defining characteristics that differentiate them in relation to operating principles and their strategic potential. This approach allows a clear delineation of the intrinsic qualities of each type of business model, highlighting how they can be correlated with the specific objectives of an organization. The analysis aims to demonstrate that choosing an appropriate archetype does not represent a static process, but a dynamic one, influenced by factors such as technological innovation, changes in consumer behavior, sustainability pressures, and global market trends.

Although there is no typology of business models in the specialized literature, numerous authors propose partial classifications or taxonomies based on specific criteria and examples. Building on these contributions, we aim to develop our own classification, which integrates the main identified models, groups them according to relevant criteria, and provides a coherent conceptual framework for their analysis and comparison in the current business environment. In constructing the proposed classification of business models, classification criteria derived from the analysis of the defining characteristics of the types identified in the specialized literature were used. The first criterion refers to the main source of revenue, as it reflects the fundamental mechanism through which organizations ensure their financial sustainability (e.g., direct sales, subscriptions, licensing, advertising). The second criterion is the nature of the value proposition, which allows differentiation between models centered on physical products, intangible services, combinations of these, or brand experiences, aspects that directly influence market positioning. A third criterion is the main delivery channel, physical, digital, or hybrid, since the mode of value distribution has a major impact on cost structure and market access. Additionally, the degree of innovation and orientation toward sustainability was considered an essential criterion, given the increasing importance of technology-based, digital, and ecologically principled models in long-term competitiveness.

Table 3: Proposed classification of business models

Criterion 1: Business models generating revenue through direct sales, focused on efficiency, reliability, and short-term transactional customer relationships.	Criterion 2: Business models generating stable, recurring revenue by providing continuous access to products or services, fostering long-term customer relationships.	Criterion 3: Business models generating revenue from digital platforms or data, leveraging connectivity, network effects, and evolving customer relationships.

Traditional Transactional Business Models ▪ Retailer Business Model ▪ Manufacturer Business Model ▪ Distribution Business Model	Recurring Revenue Business Models ▪ Subscription Business Model ▪ Leasing Business Model ▪ Product-as-a-Service Business Model	Digital Business Models ▪ E-business/ Digital Business Model ▪ Platform Business Model ▪ Big Data Business Model
Criterion 4: Business models generating revenue from sustainable products or services, highlighting environmental, social, and economic value with ethical customer relationships.	Criterion 5: Business models generating revenue from licensing, partnerships, or bundled offerings, emphasizing brand access, marketing reach, and contract-based customer or partner relationships.	Criterion 6: Business models generating revenue from hybrid offerings, combining free and premium services or analytical tools, emphasizing accessibility, strategic insight, and participatory customer relationships.
Sustainable-Oriented Business Models ▪ Sustainable Business Model ▪ Circular Economy Business Model	Licensing and Partnership Business Models ▪ Franchise Business Model ▪ Advertising & Affiliate Marketing Business Model ▪ Bundling Business Model	Hybrid and Innovative Business Models ▪ Freemium Business Model ▪ Business Model Canvas

(Source: created by authors)

Furthermore, the criterion of the type of customer relationship distinguishes between transactional, continuous, partnership, or community relationships, highlighting customer loyalty and engagement strategy. The selection of these criteria aimed to ensure a coherent classification, with theoretical relevance and practical applicability, capable of integrating the diversity of encountered models and facilitating their adaptation to different organizational and market contexts. Although the proposed typology provides a clear framework for categorizing different business models, it also presents a series of inherent limitations.

First, the classification has a conceptual nature and is based on the interpretation of the general characteristics of models from the literature, which means it may be influenced by the researcher's subjectivity and the selection of consulted sources.

Second, given the dynamics of the business environment, models are in continuous evolution, making the typology valid in a certain temporal context but requiring periodic updates. Additionally, there are overlaps between some categories, as in practice many models are hybrid, borrowing elements from multiple types, which may complicate strict classification into a single category.

Furthermore, the typology does not capture in detail sectoral specificities or cultural and legislative differences that may influence the applicability of models in various regions. Ultimately, the purpose of the typology is not to provide an exhaustive or universally valid classification, but to constitute an analytical and guiding tool, adaptable according to the particularities of each organization and market context.

5. Conclusion

The study concludes that the proposed classification framework offers a structured perspective on the diversity of business models identified in the literature. By distinguishing between typologies, taxonomies, and classifications, the paper contributes to clarifying conceptual ambiguities and provides a coherent foundation for future research. The analysis integrates both theoretical and empirical dimensions, suggesting that business models can be better understood when examined through multiple criteria such as revenue sources, value proposition, delivery channels, and sustainability orientation. The methodological approach, based on a systematic literature review and elements of grounded theory, ensures a balanced combination between conceptual rigor and practical applicability. Although the classification remains provisional and context-dependent, it represents a useful analytical tool for organizing existing models and identifying emerging forms of value creation and innovation in the business environment.

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THE STRATEGIC IMPORTANCE OF THE CIVIL SECTOR IN ADVANCING SOCIAL INTEGRATION AND EQUAL OPPORTUNITIES IN THE LABOUR MARKET

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Abstract: *The function and economic significance of nonprofit organizations in promoting social inclusion are becoming increasingly prominent in contemporary society. This trend is driven not only by the transformation of governmental engagement and the growing activity of civil organizations but also by the rising importance of community relations and the rethinking of the traditional institutional system based on the state and the market. The civil sector – in the form of associations and foundations – responds to social needs that state and market actors often fail to address flexibly. Nonprofit organizations not only complement public services but also offer unique, community-based services. They play a particularly important role in supporting labor market integration, especially for disadvantaged groups such as the Roma, individuals with low educational attainment, or those with reduced work capacity. The training, mentoring, and social support programs provided by civil organizations form a bridge between job seekers and the labor market, facilitating their inclusion in economic activity.*

The rapid transformation of globalization and socio-economic structures further underscores the need to place cooperation between civil society and the public sector on new foundations and strengthen it. The nonprofit sector has by now become not merely a complementary actor but a strategic one in the renewal of society, particularly in areas where reducing inequality and enhancing inclusion are essential.

They also contribute to increasing social cohesion, strengthening active citizenship, and solidifying democratic values, thereby making the social system more sustainable in the long term. By addressing specific local challenges and involving communities in problem-solving processes, nonprofit organizations not only fill institutional gaps but also foster innovation and participation. As such, they play a vital role in shaping inclusive societies that prioritize human dignity, equal opportunities, and solidarity. Nonprofit organizations play a crucial role in addressing labor market inequalities by providing access to skills development, job placement services, and tailored support. Their adaptive, person-centered approaches enable more inclusive employment pathways, particularly for individuals facing structural barriers, thereby contributing to a more equitable and resilient labor market.

Keywords: *nonprofit organizations; community engagement; social integration; employment*

JEL Classification: Z13 (other special topics, Economic Sociology; Economic Anthropology; Language; Social and Economic Stratification)

1. Introduction

The civil sector encompasses those organizations and self-organizing initiatives based on social self-activity that aim to meet the specific needs of a given community through their operations. These activities allow for direct responses to social problems and welfare needs, while also encouraging civic participation and cooperation. The prevalence, structure, and thematic focus of civil initiatives reflect the quality of community relations, the depth of social solidarity, and the development of cooperation among individuals.

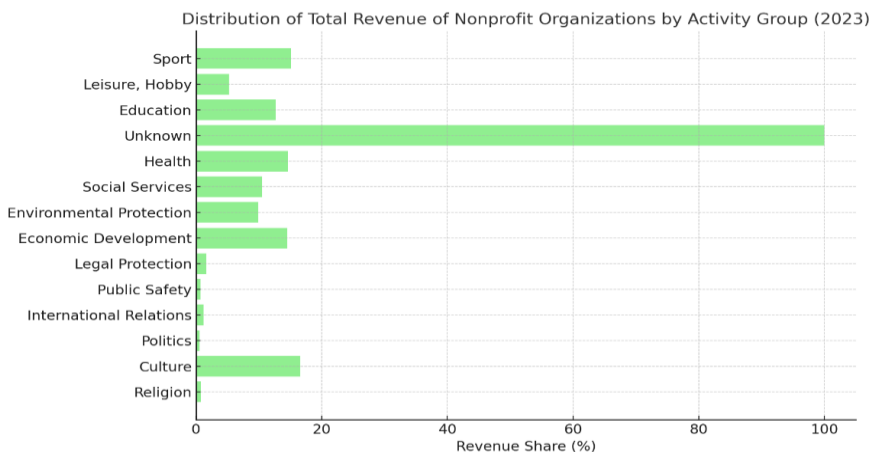
The operation of the civil sector is characterized by significant territorial concentration. The vast majority of organizations choose the form of foundations or associations, which influences not only their goals but also the geographical scope of their activities. Nonprofit organizations often provide alternatives to public services, complementing the efforts of the state. This role is increasingly acknowledged and supported by the government, which gradually expands the scope for civil involvement, thus partially easing the burden on its institutional system (Fricz, 2019). The activity spectrum of the civil sphere is extensive: beyond cultural, sports, leisure, and educational programs, civil organizations are playing an increasingly important role in healthcare services, social care, local community development, and urban development initiatives.

Following the regime change—particularly from the 1990s onward—a significant increase in the number of nonprofit organizations was observed in Hungary. Hungary's accession to the European Union opened access to funding opportunities, giving new momentum to the expansion of the civil sector. In order to sustain their operations and realize their objectives, nonprofit organizations actively participate in both national and EU-funded grant programs. The most successful applicants tend to be those involved in economic development, social services, educational, and cultural activities. The majority of their operational expenses are allocated to maintenance costs and employee wages. It is important to emphasize that civil society organizations are increasingly playing a pivotal role in facilitating labor market integration. Their activities are particularly critical in supporting the social and economic reintegration of disadvantaged groups—such as individuals with low levels of education, Roma communities, people with reduced work capacity, and long-term inactive jobseekers. Nonprofit organizations implement targeted employment programs, training schemes, counseling, and mentoring services designed to support these individuals in entering or re-entering the labor market.

In addition, civil organizations offer flexible employment opportunities tailored to individual needs and life circumstances, thereby accommodating those who may not thrive within traditional employment structures. In doing so, the civil sector assumes an irreplaceable role not only in providing social support but also in addressing structural inequalities within the labor market. Their work significantly contributes to the promotion of equal opportunities in employment and supports the long-term sustainability of the economy by activating otherwise marginalized or excluded groups.

2. Structural characteristics and socio-economic role of the civil sector in Hungary

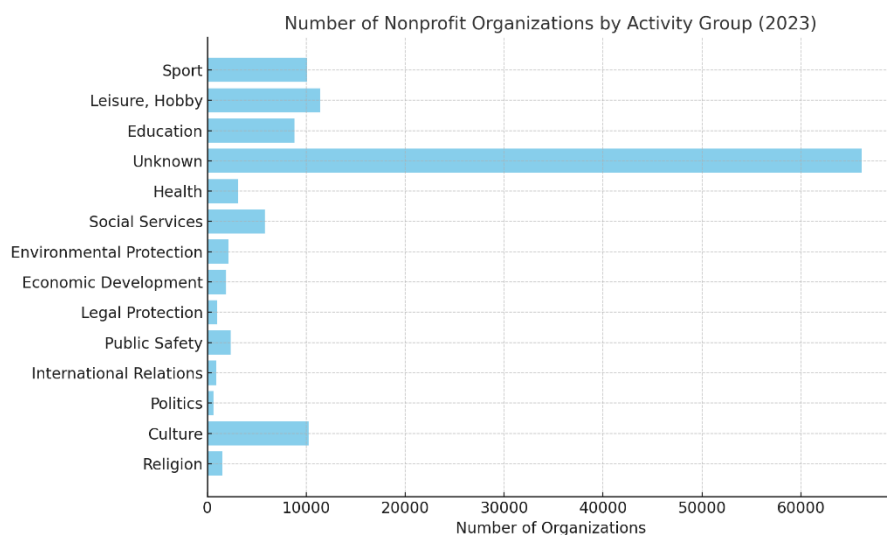
According to the latest data of the Central Statistical Office for 2023, there were approximately 61 thousand non-profit organizations operating in Hungary. The vast majority of these, approximately 88%, belong to the classic civil sector, i.e. they carry out their activities in the form of foundations or associations. The number of associations was 35,405, while that of foundations was 18,242, so the ratio of two-thirds to one-third between the organizational forms remained similar to previous years. The structure and operation of the organizations continue to show that social participation based on citizen initiative plays a significant role in the Hungarian civil sphere. The impact of the COVID-19 pandemic on the sector was still evident in 2023, especially in the field of volunteering. The estimated number of volunteers decreased from 381 thousand in 2019 to 373 thousand in 2023. Nevertheless, the activities they perform represent significant social and economic value: the estimated value of the hours worked reached HUF 83 billion, which is equivalent to the annual work of about a thousand full-time employees. The presence of volunteers is especially dominant in classic civil society organizations, where a significant part of the human resources is provided by unpaid workers, as opposed to non-profit organizations, where the vast majority of employees work as employees. The economic weight of the civil sector is also significant. Classic non-profit organizations realized a revenue of 1,344.5 billion forints in 2023, which exceeded the value in 2022 by 52 billion forints. Nearly 60% of the revenue came from various forms of support. Within this, the amount of state and local government funds exceeded 534 billion forints, while EU and other private subsidies amounted to another 294 billion forints. Another important source of income for the operation of associations is membership fees, which exceeded 47 billion forints in 2023. These figures also clearly show that the civil sector is not only a community organizer, but also a significant factor in the national economy in economic terms, representing a weight of about 4.5% compared to GDP.



1. Figure: Distribution of Total Revenue of Nonprofit Organizations by Activity Group (2023)

Source: KSH data, 2023, online

The employment role of the civil sector cannot be neglected either. The number of people employed by non-profit organizations was 162,192 in 2023, of which nearly one-third were employed in the classical civil sector. Within this, in addition to full-time employees, there are also a large number of part-time, pension-related, and project-based employees. Flexible working forms are particularly characteristic of organizations that integrate disadvantaged groups – such as the elderly, people with disabilities, or young people – into their programs. This structure not only increases labor market flexibility, but also contributes to the promotion of social inclusion and equal opportunities. The range of activities of non-profit organizations remains diverse. Most organizations serve cultural (16.6%), sports (16.5%), leisure (15.8%) and educational (12.5%) purposes. The operation of foundations is primarily related to the fields of education (33%), social care (16%) and culture (15%), while sports and leisure activities, as well as cultural programs, continue to be decisive among associations (KSH 2023). These activities not only improve the quality of life of the given communities, but also contribute to strengthening social integration, cohesion and participation. In light of the above data, it is clear that the civil sector has now become a key player in Hungary, not only in social, but also in economic and labor market terms. Its significance is unquestionable not only in community services, but also in addressing social problems, ensuring equal opportunities and serving the segmented needs of the labor market.



2. Figure: Number of Nonprofit Organizations by Activity Group (2023)
Source: KSH data, 2023, online

3.The social role of civil society organizations and their role in promoting integration

Equal access to employment is a fundamental prerequisite for promoting social inclusion and the closely related goal of reducing and combating poverty. The importance of improving employment conditions must be understood at the level of society as a whole, but it is particularly important for disadvantaged groups of workers who, for whatever reason, find themselves on the margins of society. The promotion of employment among women, migrants, and Roma workers depends on two inseparable factors. One is whether the members of a given social group have the skills, abilities, competencies, and motivation necessary to participate in the labor market. The other is how inclusive and accepting (tolerant) the social environment is, which can either help or hinder the successful integration of these groups into the labor market. In our analysis, we do not examine the characteristics of the social environment (e.g., prejudice), nor do we discuss all disadvantaged groups of workers; in this case, we focus on the labor market situation of the Roma.

Civil society organizations have become indispensable actors in social, economic, and cultural life. Through their community involvement, they contribute significantly to alleviating and addressing social problems and meeting a number of community needs. Their activities are visible at several levels of society, from local communities to national structures. Their institutions and programs help citizens to assert their interests, strengthen social participation, and develop active citizenship (Nárai, 2004). Active participation in this sector is a particularly educational, socializing, and motivating experience for young people. Community involvement fosters behaviors and social sensitivity that lay the foundation for future civic attitudes. Volunteering among young people promotes community activity in adulthood and strengthens social ties and cooperation skills (Carson, 2002). Such experiences also contribute to young people developing a more empathetic attitude towards different strata of society and its problems. The increase in the number of civil society organizations in recent decades is linked to new challenges emerging in society and the resurgence of previously known social problems. In this context, civil society organizations not only provide services, but also act as a bridge between the state, the market, and society. Their unique characteristics enable them to take on social roles that other sectors are less able to perform effectively (Glózer, 2000). The diversity of civil society promotes the strengthening and deepening of democracy. Civil initiatives are capable of transforming local interests into higher, even public interests, and representing them in decision-making. A healthy civil sphere offers members of society alternatives and choices in their involvement in public life, thereby increasing the level of social capital and willingness to cooperate (Putnam, 2000). The activities of civil society organizations encourage individuals to become involved in shaping public life, thereby contributing to the development of the community as conscious citizens. Social engagement increases solidarity, a sense of responsibility, and initiative. In the long term, these attitudes contribute to the formation and deepening of civic identity and the consolidation of the foundations of democratic functioning (Seligman, 1997). This activity also satisfies a kind of psychosocial need: it creates opportunities for individuals to express themselves, increase their self-confidence, and strengthen their social relationships. Belonging to an organization provides a sense of belonging, while also offering support to those in crisis

situations, such as the unemployed or retirees. For them, civic participation also maintains a sense of social usefulness, which is important for maintaining social integration (Kuti, 1996). The functioning of civil society is also one of the drivers of social policy innovation. In many cases, civil society organizations are able to respond quickly and flexibly to social needs, offering alternative solutions where the state or market cannot intervene effectively. Many social services that are now institutionalized originally started as civil society initiatives. As a result, civil society now performs public tasks and has become an important player in the functioning of the welfare system (Nárai, 2004). It is also becoming an increasingly active participant in the processes of social redistribution. Through fundraising and support programs, the state, the corporate sector, and the general public also become part of this redistributive mechanism, which most often targets disadvantaged groups. The role of civil society organizations in labor market integration has become particularly important in recent years. As employers, they provide flexible work opportunities for people who find it difficult to succeed in the open labor market. A significant proportion of employees in the civil sector work part-time, alongside their pension, with changed working capacity or in temporary employment (KSH, 2024). In addition, training courses, mentoring programs, and community employment models organized by civil society organizations contribute to the development of labor market skills, increased independence, and longer-term employment. As actors in the social economy, for example through social cooperatives, they provide temporary employment for those who have been excluded from the primary labor market (Nárai & Pálné, 2013). Volunteering also functions as an integration mechanism. Through volunteer work, individuals not only create community value, but also develop themselves, acquire skills, and build new networks. This process is particularly useful for those who are unemployed, starting their careers, or have been permanently inactive. In addition to its economic benefits, volunteering therefore also serves to create opportunities (Feischmidt & Zakariás, 2018).

4. Labor market vulnerability and characteristics of the precariat

There are many social groups in the labor market that are particularly vulnerable to economic uncertainty, underemployment, and the risk of being excluded from the labor market. According to the World Bank (2017), the unemployed, the inactive, and those in atypical, insecure forms of employment are all considered "vulnerable" labor market participants. This category is particularly heterogeneous, as it includes, for example, middle-aged individuals who have been forced into early retirement, as well as young people who are neither in education nor employment (NEET group). It also includes those who work low hours or for low wages, often in temporary, non-standard employment arrangements, even if they are formally considered full-time employees. The theory of labor market segmentation—based on Huszár and Sik (2017)—argues that the labor market does not function as a unified system, but can be divided into distinct segments. These segments are not interchangeable and structurally fix certain social groups in different labor market positions. Based on the classic theory of Galasi and Sik (1979), the labor market can be divided into two basic parts: the primary and secondary segments. Those working in the primary sector enjoy stable employment conditions, higher wages, and more secure labor law protection, while those working in

the secondary sector often work for low wages, in poorer working conditions, and their position in the labor market is vulnerable, often subject to discrimination (Sík & Szeitl, 2016). The concept of the precariat, introduced into international literature by Standing (2012), is linked to this secondary labor market segment. The precariat refers to a social group living in typically unstable working conditions, whose members are often forced to change jobs, whose income is unpredictable, and who do not have a clear professional identity or long-term career model. This combination of characteristics contributes to the social and economic marginalization of precarious workers, who live in a state of constant uncertainty. The typical precarious worker is employed on a fixed-term contract, often as a subcontractor or temporary worker.

According to Standing (2012) and R. Fedor (2021), a significant proportion of the precariat relies on welfare systems that are subject to increasingly stringent eligibility criteria. As a result, many are completely excluded from the support network, which further deepens their poverty and increases their marginalization in the labor market. This phenomenon is particularly worrying in the case of social groups that are already disadvantaged, such as Roma communities, people with low levels of education, or the long-term unemployed.

The role of civil society organizations is particularly important in this context, as in many cases they are the first to provide support and services to these vulnerable groups. They help with reintegration into the labor market, offer alternative forms of employment, and provide skills development and counseling programs that help increase employment opportunities.

5. The role of the civil sector in employment and creating opportunities in the labor market

Civil society organizations play a decisive role in promoting employment in Hungary, especially among disadvantaged groups who have been excluded from the labor market. In their operations, they often make use of state or municipal subsidies and various grant funds, which are intended not only to finance their operations but also to expand employment. In some cases, these subsidies are linked to the partial assumption of state tasks, thus the civil sector also contributes indirectly to the provision of public services. Thanks to their flexible organizational structure, they offer an ideal environment for implementing various employment experiments and innovative programs. Particular attention should be paid to county-level programs that target rehabilitative employment, productive school programs, or the employment of homeless people. Experience shows that civil society organizations are particularly effective in integrating disadvantaged social groups into the labor market, as their personalized approach, direct support, and local roots enable them to reach people whom the state system is unable to successfully reintegrate into employment (Székely, 2010). The typical activities of these organizations include providing labor market information, career and job search counseling, organizing educational and tutoring programs, and providing health and social support, including welfare assistance. These tasks not only complement the social welfare system, but also promote employment, as they directly contribute to improving the labor market suitability and employability of disadvantaged people.

According to 2023 data from the Hungarian Central Statistical Office (KSH), 90,331 people worked full-time in the non-profit sector, with an additional 18,196 working part-time. The total number of employees thus exceeded 108,000 (KSH, 2024a). In addition, civil society organizations mobilize a significant number of volunteers: in 2023, nearly 306,000 volunteers worked, collectively completing more than 39 million working hours (KSH, 2024b). This activity not only supports the functioning of organizations, but also plays a key role in social integration, especially for people who have been inactive or excluded from the labor market for a long time. Structural changes in the labor market, digitalization, demographic changes, and crisis situations—such as the COVID-19 pandemic—have made it necessary to involve new actors in the labor market.

Civil society organizations are able to establish direct contact with marginalized groups and operate trust-based support systems that can be more effective than formal institutions. At the European Union level, there is also a recognized need to expand employment in cooperation with the civil sector, and this approach is continued in the EU strategy for 2030 (European Commission, 2021). The involvement of local actors and institutionalized partnerships are essential for the implementation of effective and sustainable employment policies. This partnership is based on cooperation between local governments, vocational training institutions, employment agencies, employers, entrepreneurs, professional organizations, and civil society organizations. Such cooperation, based on clear objectives set out in a contract and organized as a system at the regional level, can contribute effectively to addressing employment problems and creating opportunities.

6.The impact of civil society organizations on regional development and community cohesion

Civil society has a significant and growing influence on economic and social development at the local and regional levels. László Osváth's (2005) study highlights that the activities of civil society organizations are typically focused on a single municipality or a specific part of it, but their impact extends to the wider environment and the development of the entire region. The development of a given area is inconceivable without the participation of the people living there and active social actors, including civil society organizations. Although regional development decisions often come from above, at the government level, the opinions of the local population and organizations are of fundamental importance in terms of the actual professional content and local realities. One of the keys to effective regional development is that local actors, including civil society organizations, feel ownership of the development directions and participate actively in shaping them. Civil society organizations play an irreplaceable role in setting community goals and identifying local needs. They only support development directions with which they can identify and which reflect genuine social needs. Through this role, they exercise a kind of civil control over development processes, in which they not only form opinions but also make corrective proposals where appropriate. The regional impact of the civil sector can be measured not only in social but also in economic terms. Organizations not only provide community services, but also contribute to increasing local employment and creating jobs. At the same time, their impact may vary from region to region, especially between more developed and

less developed regions. Although domestic indicators currently lag behind those of the more developed Member States of the European Union, civil society organizations have significant potential in this area as well. The willingness of organizations to cooperate and network promotes the efficient use of resources, improves the quality of services, and creates new employment opportunities. Cooperation can expand financing opportunities, which opens up further development.

7. Results

Civil society organizations are now indispensable actors in the functioning of society, especially in sensitive areas where the state and market sectors have limited capacity to respond effectively. These organizations are unique in that they are in direct contact with communities, enabling them to respond credibly and quickly to emerging issues. Their tasks include strengthening social cohesion, supporting disadvantaged groups, promoting equal opportunities, and combating prejudice and social exclusion. These objectives contribute, directly or indirectly, to building social trust, which is one of the cornerstones of sustainable and inclusive development.

Social relations and community ties are of paramount importance for the development of a region. Civil society organizations actively contribute to the creation, maintenance, and strengthening of these relationships. Their work can foster a sense of local identity, belonging, and loyalty to the region, which encourages individuals and communities to participate actively. Civil activity helps local communities recognize their own interests and represent them through joint action. In contrast, disadvantaged, marginalized regions often experience a narrowing of social networks, a weakening of community activity, and the migration of the mobile, active population. This process further deepens regional deprivation in a self-reinforcing manner, making the strengthening of civil society and activism a strategic tool for catching up. Civil society can therefore be not only a partner, but also an initiator and shaper of a region's economic and social development. It plays a particularly important role in enabling stakeholders to shape the future of their region themselves – and this participation is not only a democratic value but also a prerequisite for effective development.

One of the most important features of its operation is that it does not pursue profit-oriented goals but focuses on strengthening social participation and responsibility. Its founders and active members are usually deeply committed to achieving community goals, which ensures the credibility and sustainability of the sector. Civil society organizations are able to accept and support grassroots initiatives and offer alternative solutions that go beyond the framework of formal systems. Their flexible operation, direct social embeddedness, and dialogue-based approach enable them to act as credible partners to communities, thereby strengthening social cooperation.

The work of non-profit organizations is particularly valuable in promoting labor market integration. In many cases, they provide assistance to individuals and groups—such as the long-term unemployed, people with disabilities, Roma, young people starting their careers, or those with low levels of education—who are not or only with difficulty accessible through traditional public and market-based labor market services. Voluntary programs, training, mentoring opportunities, vocational training, and alternative forms of employment provided by civil society organizations not only prepare participants for

employment, but also develop their social skills, self-confidence, and community ties. They play a key role in improving the labor market opportunities of disadvantaged people, especially where the capacity or flexibility of the public welfare system is limited. Civil society organizations often act as intermediaries between labor market actors and target groups, thereby facilitating job placement and labor market retention. They also provide support in the areas of social work, information provision, counseling, health care, and childcare—all of which are complementary services that contribute to improving employability. Their role in labor market integration also creates value for the economy. Volunteering is a particularly important integration tool, as it not only provides work experience, but also builds new networks, reduces isolation, and facilitates subsequent placement in the open labor market.

Overall, the involvement of civil society organizations in society and the labor market not only improves the quality of life in communities, but also contributes to a more balanced and fairer economy. The active presence, professional knowledge, and people-centered approach of the civil sphere are indispensable in addressing the complex and ever-changing challenges of social integration. Our responses to the challenges of the future must therefore take into account the strengthening of civil society organizations and the conscious development of their integrated role.

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OVERVIEW OF THE HEALTH AND ECONOMIC SITUATION OF SZABOLCS-SZATMÁR-BEREG COUNTY

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Abstract: This paper explores the economic and health conditions of Szabolcs-Szatmár-Bereg County, with a particular emphasis on socially disadvantaged populations, especially the Roma communities living in segregated areas. The study investigates the interrelation between socio-economic determinants and subjective health status, highlighting the role of structural inequalities in shaping health outcomes. The region's economic performance remains significantly below the national average, as evidenced by persistently high unemployment rates, low average income levels, and a continuing pattern of outmigration. The Roma population is disproportionately affected by these challenges, facing both economic and health-related vulnerabilities that contribute to the overall underdevelopment of the county. The findings reveal a pronounced lack of health awareness within these communities, compounded by limited access to education, vocational training, and essential public health services. The research further confirms that poor health indicators among the Roma are closely linked to low educational attainment and unfavorable living conditions, reinforcing cycles of exclusion and socio-economic disadvantage. It is argued that any effort to improve the region's socio-economic standing must be grounded in an integrated policy approach that simultaneously targets health promotion and economic development. Priority should be given to inclusive initiatives that strengthen health literacy, improve access to preventive care, and facilitate labour market integration, particularly among marginalized groups. Based on the evidence, the paper recommends focused investment in health education programmes, the expansion of vocational training, and the active inclusion of the Roma population in local development efforts. These measures are essential for breaking the interconnected patterns of deprivation and enabling sustainable growth in the region. Ultimately, improving the health of the most vulnerable is not only a moral imperative but also a strategic condition for achieving long-term economic resilience and social cohesion in Szabolcs-Szatmár-Bereg County.

Keywords: Szabolcs-Szatmár-Bereg County; health status; Roma population; subjective health; socio-economic factors; health education.

JEL Classification: I14; I18; J15; R23; H75

1. Introduction

The focus of our research is on the health behaviour and subjective health status of women living in segregated communities. The term refers to all actions and habits that contribute to maintaining, improving, or restoring health. These practices are particularly

relevant, as a significant proportion of deaths result from diseases linked to unfavorable lifestyle patterns. Such conditions can be positively influenced by effective interventions, and therefore deserve particular emphasis in the fields of prevention and health promotion (Bíró, et al., 2008, 149 évf.,46. szám).

An individual's health is closely linked to their economic situation. The county of Szabolcs-Szatmár-Bereg is one of the regions with one of the worst economic indicators in the country, where Roma communities living in settlements are in a particularly difficult situation. These social groups suffer not only economic but also health-related disadvantages, which contribute to the overall socio-economic backwardness of the county (Tar & Hajnal, 2014).

The Roma community faces serious challenges, not only in terms of cultural, educational and economic deprivation, but also in terms of health. Among these, the most vulnerable group are those living in squatter settlements, for whom access to health care is particularly limited. Health is a fundamental, universal value in the life of every human being, but its maintenance depends on many factors. It depends not only on individual responsibility, access to health care and equal treatment, but also on the level of basic health literacy. In the absence of such knowledge and the awareness to build on it, maintaining and improving health becomes virtually impossible, which is a major and ongoing challenge for the Roma community in settlements. Therefore, reducing health inequalities requires not only improving access to care, but also strengthening health awareness and individual responsibility, which will empower affected groups to take active action for their health (Ember, 2019). Awareness of preventive services for Roma population should be a priority in order to improve their willingness to be screened and thus their overall health status (Libicki & R.Fedor, 2022).

Our research is also underpinned by complex social science models and focuses on subjective health, with a focus on specific social groups. Our research also presents unemployment rates and economic indicators, as this information is significantly correlated with health status.

In the present article we would like to give an overview of the economic situation in Szabolcs-Szatmár-Bereg County based on a comprehensive, short literature survey. In our literature review, we would like to focus indicators that are related to both economic and health aspects.

2.Data And Methodology

Socio-economic factors have a major impact on the health status of individuals and communities. In Ádány's view, the health of a society is fundamentally determined by the state of the most disadvantaged population group, much like the strength of a chain is determined by its weakest link. This idea highlights the fact that without improving the health of disadvantaged communities, such as the Roma population, no significant improvement in the health indicators of society as a whole can be achieved (Ádány, n.d.).

This also applies to economic indicators. If we can develop and educate those groups who are in the most difficult economic situation, we will also improve the overall economic situation of society, as they have a strong impact on each other.

The social and economic characteristics of Szabolcs-Szatmár-Bereg county are difficult to match with the national averages, as it has extreme indicators in many areas compared to other counties. This specific situation is due to a number of complex factors, including geographical location, demographic characteristics and the dominant role of the historical past. These factors have contributed significantly to the county's specific social and economic conditions and its underdevelopment (Tar & Hajnal, 2014). Szabolcs-Szatmár-Bereg county is the sixth largest and third most populous county in Hungary. The county has a total area of 5,936 km² and comprises 229 settlements, of which 28 have urban status and the remaining 201 are villages. The county's administrative and economic center is Nyíregyháza, which is also the county's capital (Északkelet-magyarországi Gazdaságfejlesztési Zóna, 2020. november).

According to the latest data of the Hungarian Central Statistical Office (KSH), the population of Szabolcs-Szatmár-Bereg county was 521 000 on 1 January 2023, a decrease of 1.2% compared to the previous year. Over the last twenty years, the population of the county has been steadily decreasing, by an average of 2 500 persons per year. In recent years, this trend has accelerated, in particular due to the emigration of young people of working age. Both natural attrition and a negative net migration balance play a significant role in population decline (KSH, 2023).

Currently the county has a population density of 88 persons per km², which is significantly lower than the national average.

Current demographic trends suggest that population decline will continue in the coming years (KSH, 2023).

Labour market situation in the county

In the 4th quarter of 2023, the unemployment rate in Szabolcs-Szatmár-Bereg county was at the highest level in the country, at 10.6%. This figure is significantly higher than the national average of 3.8% for the same period. In general, the unemployment rate in the country varied between 1.8% and 10.6%, but Szabolcs County stood out in terms of negative statistics (KSH, 2023).

For comparison, for example, the unemployment rate in Győr-Moson-Sopron County was among the lowest at only 1.8%, clearly showing the regional economic disparities within Hungary. In comparison, the difficult economic situation of Szabolcs county, its less diversified industrial base and its less educated population contribute to its higher unemployment rate.

A munkanélülék aránya, 2022

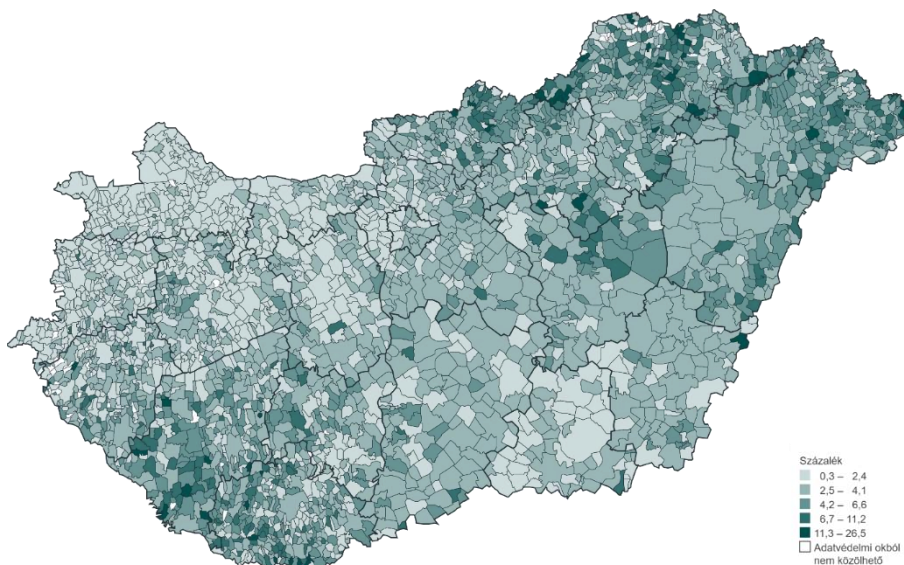


**Figure 1. Unemployment rate, 2022,
Source: (KSH, 2022) , viewed 05.01.2025.**

Furthermore, the employment rate in Szabolcs County was 68.1%, which is also below the national average. The counties with the most favorable data in the country, such as Pest and Győr-Moson-Sopron, achieved employment rates above 75%, indicating that these regions are economically stronger and more stable.

Several factors may be behind the high unemployment rate in Szabolcs-Szatmár-Bereg county. These include youth emigration, low levels of industrial development and a limited number of high value-added jobs. A large part of the county's economy is based on agriculture, which is seasonal, making it even more difficult to ensure continuous employment.

These indicators highlight the need for significant development interventions to stabilize the county's labour market, including industrialization, raising educational standards and diversifying the local economy. Long-term strategic solutions would be needed to bring the county closer to the national average, which could encourage the retention of the workforce and economic development (KSH, 2023).

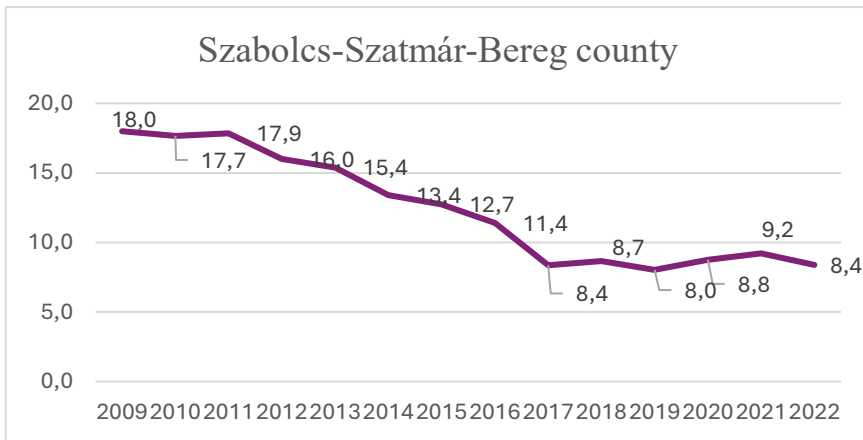


Figure 2. Unemployment rate 2023.
Source: (KSH, 2023). own edit, 2025.01.05.

Educational attainment indicators

Unfortunately, the level of education in Szabolcs-Szatmár-Bereg county continues to lag significantly behind the national average, which has a serious impact on the county's economic situation and labour market prospects. According to the most recent data for 2022, 22% of the population aged 15 and over in Hungary will have a degree, while another third will have a school leaving certificate. Based on the 2022 data, it is clear that the share of people aged 25-64 with less than primary education in Szabolcs county is much higher than the national average. This ratio is particularly unfavorable, as it represents a serious barrier to entering the labour market, which further exacerbates economic disadvantages (KSH, 2022).

The table below presents the national education indicators:

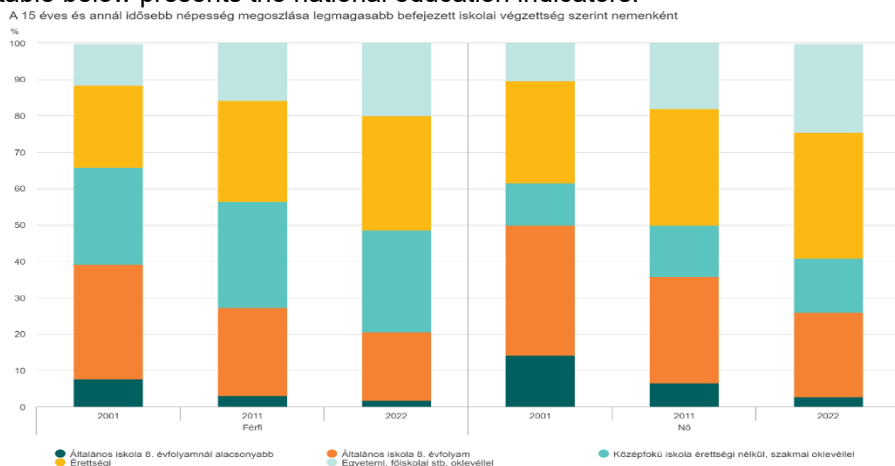


Figure 3. Distribution of the population aged 15 and over by highest level of educational attainment by sex.

Source: (KSH, 2022) , viewed 05.01.2025.

The share of people with secondary education and a school leaving certificate is also below the national average, which also reduces competitiveness and limits job opportunities in the region. And the share of graduates is even more strikingly low. For example, while the share of graduates in the Central Hungary region reaches 18.3%, the share is much lower in Szabolcs-Szatmár-Bereg county. This difference not only highlights the lack of higher education tradition, but also the county's difficulty in attracting high value-added industries, which is a fundamental constraint on economic development (KSH, 2022).

The share of people with tertiary education in the working-age population is very high in Budapest: 44%. In rural cities, almost one third of the working-age population has tertiary education, while in villages only 15% have it, as shown in the figure below.

A diplomával rendelkezők aránya a 20–64 éves népességben, 2022

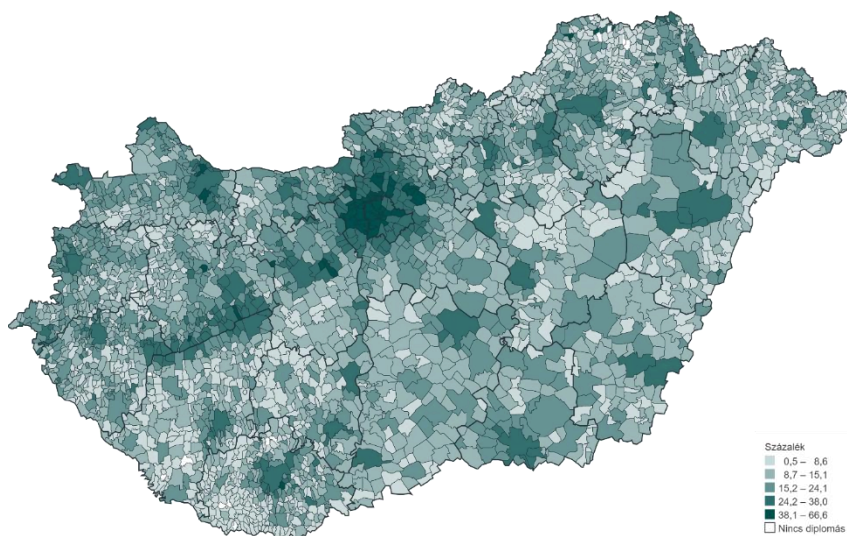


Figure 4. Share of people with a degree in the population aged 20-64, 2022

Source: (KSH, 2022) , viewed 05.01.2025.

The unfavorable educational composition of the population and the fact that a significant share of jobseekers is unskilled make it difficult to achieve sustainable employment. The lack of qualifications, low educational attainment and the associated skills shortages all contribute to the high share of long-term unemployed among job seekers. In the long term, this problem has not only economic but also social consequences, as it increases the risk of income poverty and social exclusion resulting from unemployment.

It can be seen that the disadvantaged situation in the county is also greatly influenced by the fact that the number of under-schooled people, the majority of whom are Roma, is significantly higher than the national average. This not only has an impact on the labour market, but also has a major impact on the health and health awareness of the people concerned (KSH, 2022).

The research of Róza Ádány and János Sándor focuses on the health status of Roma women and health inequalities. The research shows that the health indicators of Roma women lag significantly behind those of non-Roma women, due to a number of factors such as low educational attainment, high unemployment rates and poverty. They are more likely to suffer from chronic diseases such as cardiovascular problems and diabetes, which are exacerbated by social and economic disadvantages. Low levels of education and exclusion from the labour market significantly reduce access to health care, while knowledge about healthy lifestyles is also lacking. These factors not only lead to shorter life expectancy, but also significantly reduce the quality of life of affected people (Ádány & Sándor, 2019).

Unemployment is not only an economic but also a source of psychosocial stress, which exacerbates the health situation of Roma women. Low incomes and segregated living conditions make their situation even more difficult. The research of Ádány and Sándor (2019) emphasizes the need for complex interventions that target education, employment and health at the same time, paying particular attention to the specific needs of Roma women. (Ádány & Sándor, 2019) We believe that such integrated programmes are key to reducing health inequalities. In this context, it is important to highlight the significance of programmes aimed at preventing and alleviating health risk behaviours, particularly as the prevalence of smoking is very high in the Roma population, with a prevalence more than twice that of the average Hungarian population (M.Kornyicki, et al., 2022).

Lampek (2004) examined in detail the relationship between educational attainment and health status, particularly among women. The research found that women with higher levels of education tend to report better health, suffer less frequently from chronic diseases and live longer than their lower educated counterparts. Women with higher education have a higher prevalence of health-conscious lifestyles, such as regular exercise, good nutrition and screening, while women with lower education have a higher prevalence of smoking and other unhealthy habits. In addition, women with a higher level of education have easier access to health services and make better use of preventive opportunities. The study shows that investment in education, educational attainment and health status is closely linked and that increasing 's educational attainment could have a significant impact on reducing health inequalities (Lampek, 2004).

3.Conclusions

Overall, increasing the level of education is essential to improve the economic and social situation of the county. Increasing the number of people in vocational training and promoting adult education could be key steps. It is also important to promote higher education, which can not only strengthen the region's competitiveness but also help reduce social inequalities. Thus, one of the main challenges for economic development in Szabolcs-Szatmár-Bereg county is to increase the level of education, which is the result of a long-term and complex process.

Reading between the lines and the data, we can see that there is still a lot of work to be done in the county in terms of development. The development and future of the county depend primarily on more people being able to earn a decent income and to do useful, value-creating work.

Exclusion from the labour market poses serious challenges not only at the individual level but also at the societal level. Increasing the activity rate is a prerequisite for increasing employment, as the more people can participate in the economy, the more they can contribute to economic growth and social welfare. Comprehensive programmes that take account of the real needs of individuals are needed to help people who have dropped out of the labour market to return to work. Retraining, personalized job search counselling and skills development can be effective tools to help these people find their place back in the world of work.

Particular attention should be paid to groups for whom finding a job is particularly difficult, such as people with low educational qualifications or the long-term unemployed. They should be offered opportunities that help them to become competitive again in the labour market. A key role here is played by subsidies and training programmes for employers, which can encourage them to offer jobs to these groups. To increase employment, a well-designed, multi-level strategy is essential, taking into account the current labour market situation, economic and social challenges and individual needs. Such initiatives can not only improve the lives of the individuals concerned, but can also contribute to reducing social and economic inequalities in the long term.

Reducing the impact of inequalities as part of prevention is another priority. In this case, equality of opportunity means that access to health care is not equal for all. (Uzzoli, 2019) It is important that prevention is present at both individual and societal levels, and this requires continuous research and a well-structured prevention plan. An important step in the research work is to identify the reasons for the inadequate health-conscious behaviour of a particular social group (e.g. the Roma population living in a settlement), which we also want to investigate in our research. We highlight them in this article because they are the most economically disadvantaged group.

It is hoped that in the future, even with the help of our work, health education programmes can be developed that can make a significant difference to the health-conscious behaviour of certain groups in society, and thus to the perception of self-rated well-being.

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DETERMINANTS OF CUSTOMER LOYALTY IN THE ROMANIAN FUEL RETAIL MARKET: AN EXTENDED EMPIRICAL ANALYSIS

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Abstract: *This paper examines the determinants of customer loyalty in Romania's fuel retail market, an emerging and highly competitive sector where service differentiation and brand trust increasingly shape consumer behavior. The study addresses three central questions: what factors influence drivers' loyalty to petrol station brands, to what extent satisfaction and brand image shape repurchase and recommendation intentions, and how demographic and behavioral profiles contribute to loyalty formation. Building on a nationwide survey of 1,195 active drivers, the research employs a quantitative approach integrating descriptive analysis and comparative evaluation across market-leading brands. The study investigates customers' perceptions of service quality, satisfaction, brand reputation, and loyalty program engagement, and explores the relationship between these constructs and behavioral loyalty patterns. The empirical findings indicate that satisfaction, perceived service quality, and brand reputation are the strongest predictors of loyalty, particularly for well-established brands with extensive networks and consistent customer experiences. Digital engagement and personalized loyalty programs also emerge as relevant drivers, especially among younger consumer segments. The results further show notable variations in loyalty based on age, income, and refueling frequency, highlighting the need for targeted marketing strategies. This research contributes to a deeper understanding of loyalty formation in an emerging European fuel market and provides actionable insights for managers seeking to enhance customer retention. The findings are valuable for fuel retailers aiming to differentiate beyond price competition and strengthen long-term consumer relationships through service consistency, digital innovation, and customer-centric loyalty initiatives.*

Keywords: *brand loyalty, customer satisfaction, consumer decision-making, service marketing, digital marketing tools, brand perception.*

JEL classification: M31

1. Introduction

In emerging markets such as Romania, customer loyalty within the fuel retail sector remains a significant challenge for both international and domestic petrol brands. Competition among major players—including OMV, MOL, Petrom, and Rompetrol—has intensified not only in relation to fuel pricing but also through efforts to differentiate customer experience, strengthen digital loyalty programs, and build brand trust. Understanding the determinants of loyalty in this environment is essential, as it directly influences market share stability, customer retention, and long-term profitability.

Existing studies indicate that loyalty in the fuel retail industry is shaped by a multifaceted interplay of service quality, brand image, convenience, and reward programs. While in mature markets such as Western Europe loyalty initiatives have been shown to enhance repeat purchasing and foster emotional attachment to brands, emerging economies often display distinct loyalty dynamics influenced by socio-economic conditions, purchasing power, and heightened price sensitivity. These contextual differences highlight the need for market-specific research, particularly as digitalization reshapes the competitive landscape and consumer expectations.

This paper examines the key determinants of Romanian drivers' loyalty toward petrol station brands, drawing on data collected through a nationwide survey of more than 1,190 respondents. The study extends prior research on satisfaction, brand trust, and loyalty program effectiveness by exploring how these constructs operate within an emerging European market.

Accordingly, the research addresses three central questions:

O1. What are the primary factors influencing drivers' loyalty to petrol station brands in Romania?

O2. To what extent do loyalty programs and perceived brand image affect repurchase and recommendation intentions?

O3. How do demographic and behavioral characteristics—such as age, income, and refueling frequency—shape loyalty patterns in the fuel retail sector?

The paper is structured as follows: Section 2 presents the relevant literature, Section 3 describes the methodology, Section 4 reports and discusses the empirical findings, and Section 5 concludes with managerial implications.

2. Literature Review

Customer loyalty has become a cornerstone concept in marketing and service management research, representing a key driver of long-term business profitability and brand competitiveness (Oliver, 1999; Bourdeau, Cronin & Voorhees, 2024). Loyalty is not limited to repeated purchasing behaviour but also includes the attitudinal and emotional attachment of consumers toward a specific brand (Chaudhuri & Holbrook, 2001). In mature industries, loyalty ensures stable demand and positive word-of-mouth, while in emerging markets it often serves as a buffer against economic volatility and price fluctuations (Wait, Naudé & Gopaul, 2020).

The most influential conceptualization is that proposed by Oliver (1999), who defined loyalty as a deeply held commitment to rebuy or repatronize a preferred product or service consistently in the future, despite situational influences or marketing efforts that could cause switching (Han et al., 2018). He described loyalty as a four-phase process—cognitive, affective, conative, and action loyalty—that develops over time as customers progress from rational evaluation to emotional attachment and behavioural consistency. Later, Chaudhuri and Holbrook (2001) refined the construct by distinguishing between attitudinal loyalty (a psychological commitment) and behavioural loyalty (actual repurchase). Their brand trust–brand affect–brand performance chain remains a foundational model in marketing literature.

Empirical research confirms that satisfaction and trust act as mediating variables in the formation of loyalty (Helgesen, Håvold & Nettet, 2010; Bourdeau et al., 2024). When consumers perceive that a brand consistently meets expectations in terms of quality,

reliability, and value, trust develops, reducing perceived risk and encouraging continued patronage. In service contexts, emotional attachment and identification with the brand further reinforce this relationship, particularly in categories characterized by low differentiation, such as fuel retailing.

The fuel retail industry presents unique characteristics that make loyalty both complex and critical. Unlike other retail sectors, petrol stations compete in a market with relatively homogeneous core products (fuel types) but differentiated service experiences (Helgesen et al., 2010). Therefore, factors such as convenience, service quality, staff friendliness, cleanliness, and brand image often play a greater role in shaping loyalty than price alone (Kandampully & Suhartanto, 2000).

Helgesen et al. (2010) empirically demonstrated that both store image and chain image have significant positive effects on perceived service quality, which subsequently increases satisfaction and behavioural loyalty (Cronin, Brady & Hult, 2000). Their study in the Norwegian fuel market revealed that customers evaluate petrol stations holistically—combining perceptions of physical environment, personnel, and corporate reputation. This supports the service-dominant logic perspective, suggesting that loyalty in fuel retail is co-created through experiences rather than transactions.

In emerging economies, these relationships are influenced by contextual variables such as income level, urban infrastructure, and fuel affordability. Wait, Naudé and Gopaul (2020) found that in South Africa, the effectiveness of fuel loyalty programmes depends not only on financial incentives but also on emotional and experiential benefits (Ruyter & Wetzels, 1999). Consumers appreciate personalized communication, mobile-app integration, and the perception of fairness in reward accumulation (Wait, Naudé & Gopaul, 2020). Their findings confirm that the design and perceived equity of loyalty schemes directly affect trust and repurchase intention.

Similarly, Rossi and Chintagunta (2023) analyzed U.S. gasoline markets and concluded that loyalty programmes can moderate the impact of price changes on demand, effectively increasing price tolerance among loyal customers. This insight is particularly relevant for Romanian fuel retailers, who operate in an increasingly competitive market where price differentials between stations rarely exceed a few percentage points. By leveraging loyalty initiatives, companies can thus stabilize consumer behaviour despite volatile global oil prices (Parasuraman, Zeithaml & Berry, 1988).

In the last decade, digital transformation has redefined consumer engagement in the petrol retail industry. Mobile applications, electronic wallets, and digital loyalty cards have expanded the possibilities for personalized rewards and real-time interaction (Buhalis & Sinarta, 2019). In Romania, Panduru (2022) highlighted that most major fuel networks—OMV & Petrom, MOL, Rompetrol—have implemented digital ecosystems combining payment systems, discount coupons, and sustainability information. Such tools contribute not only to convenience but also to a perceived sense of belonging, reinforcing brand attachment among younger, tech-savvy drivers (Zeithaml, Berry & Parasuraman, 1996).

The brand experience dimension has also gained importance. When consumers associate a fuel brand with reliability, environmental responsibility, or premium service, their attitudinal loyalty tends to increase even in the absence of significant economic rewards. The sustainability perspective further strengthens this connection: Purcărea et al. (2022) observed that Romanian consumers increasingly value eco-friendly practices,

such as energy-efficient stations or carbon-offset initiatives, which in turn foster loyalty among environmentally conscious segments (Ghosh & Ghosh, 2020).

A large body of research examines how loyalty programs influence customer retention. Demoulin and Zidda (2008) demonstrated that satisfaction with the reward scheme mediates the relationship between card ownership and store loyalty. Customers who perceive rewards as fair, transparent, and attainable are more likely to continue using the brand. Meyer-Waarden (2015) further showed that both monetary rewards (discounts, vouchers) and non-monetary rewards (recognition, personalized treatment) have positive effects, although the latter often create longer-term loyalty.

In the context of fuel retailing, loyalty cards and digital apps provide a powerful mechanism for data collection and behavioural targeting. However, their success depends on maintaining trust and perceived reciprocity. Consumers expect tangible value in exchange for sharing personal information. García-Gómez, Gutiérrez-Arranz & Gutiérrez-Cillán (2012) emphasized that the likelihood of joining a loyalty program increases when consumers perceive the benefits as relevant to their consumption patterns and lifestyle. For petrol stations, this implies offering tailored benefits such as free car-wash services, coffee discounts, or bonus points during holidays—rather than generic fuel price reductions (Kim, Park & Jeong, 2004).

Based on this literature, customer loyalty in fuel retail emerges as a multifactorial construct shaped by both utilitarian and emotional factors. The empirical evidence suggests that:

1. Service quality and brand image positively influence satisfaction and trust (Helgesen et al., 2010);
2. Satisfaction and trust mediate the relationship between brand experience and loyalty (Oliver, 1999; Chaudhuri & Holbrook, 2001);
3. Participation in loyalty programs enhances repurchase intention, particularly when rewards are perceived as fair and personalized (Wait et al., 2020; Demoulin & Zidda, 2008);
4. Digital and sustainable initiatives amplify attitudinal loyalty by strengthening brand identity (Panduru, 2022; Purcărea et al., 2022).

These insights provide the conceptual framework for the present study, which examines the extent to which satisfaction, perceived service quality, and loyalty-program participation influence the brand loyalty of Romanian drivers (Caruana, 2002). Given the increasing competition and digital transformation in the Romanian petrol market, understanding these relationships is not only academically relevant but also practically valuable for marketing strategists seeking to differentiate their fuel brands in an emerging economy (Dick & Basu, 1994).

3. Methodology and Data

This study adopts a quantitative research design, aiming to identify the key determinants of drivers' loyalty towards petrol station brands in Romania. The data were collected through a structured questionnaire administered between May and June 2025, as part of a collaborative research project with undergraduate business administration students. Respondents were approached in-person at various fuel stations across multiple Romanian regions, ensuring diversity in terms of geographic and socio-demographic representation.

The survey gathered 1,195 valid responses, after excluding incomplete entries. The target group consisted of active drivers, including both private car owners and professional drivers, aged between 18 and 87 years. The sampling method was non-probabilistic, based on convenience and accessibility, but aimed to include a wide variety of income levels, occupations, and vehicle types.

The questionnaire included both demographic questions (gender, age, income, education, marital status, county of residence) and attitudinal scales related to consumer perceptions and behavioural intentions. All attitudinal items were measured on five-point Likert scales (1 = “Strongly disagree”, 5 = “Strongly agree”). The instrument was pre-tested on 20 respondents to ensure clarity and reliability of the items.

Table 1: Sample demographic characteristics
Source: Authors' own processing of survey data (2025)

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	726	60.75
	Female	465	38.91
	Others	4	0.33
Age (years)	18–24	557	46.61
	25–34	262	21.92
	35–44	143	11.97
	45–54	175	14.64
	55+	58	4.85
Marital status	Single	434	36.32
	In a relationship without children	400	33.47
	In a relationship with children	361	30.21
Monthly individual income (RON)	< 2,500	257	21.51
	2,500 – 3,999	226	18.91
	4,000 – 4,499	228	19.08
	5,500 – 6,999	156	13.05
	7,000 – 8,499	102	8.54
	8,500 - 11,999	112	9.37
	12,000 - 20,000	72	6.03
	< 20,000	42	3.51
Studies	Elementary	13	1.09
	Highschool	555	52.47
	Post-high school	72	6.03
	University	391	32.72

County of residence	Master	148	12.38
	Post-university	16	1.34
	Principle city (> 200.000 residents)	760	63.6
	Secondary city (<200.000 residents)	405	33.89
	Other country	30	2.51

Data were processed and analyzed using Microsoft Excel and IBM SPSS Statistics 29, employing descriptive and comparative techniques.

4. Results and Discussion

The descriptive analysis provides an overview of the respondents' general perceptions regarding petrol station brands in Romania. The most frequently mentioned fuel providers were OMV, Petrom, MOL, and Rompetrol, representing over 80% of total preferences. Respondents reported a relatively high level of satisfaction ($M = 4.31$ on a 5-point Likert scale) and a moderate level of loyalty ($M = 3.87$), indicating that while drivers are generally content with the quality of products and services, they remain open to switching between brands.

In order to better understand consumers' fueling behavior, respondents were asked to indicate how frequently they purchase fuel from each of the major petrol station brands operating in Romania. The analysis highlights significant differences in fueling patterns between brands, reflecting both market share and perceived service quality. Figure 1 illustrates the percentage distribution of fueling frequency across the main brands identified in the survey.

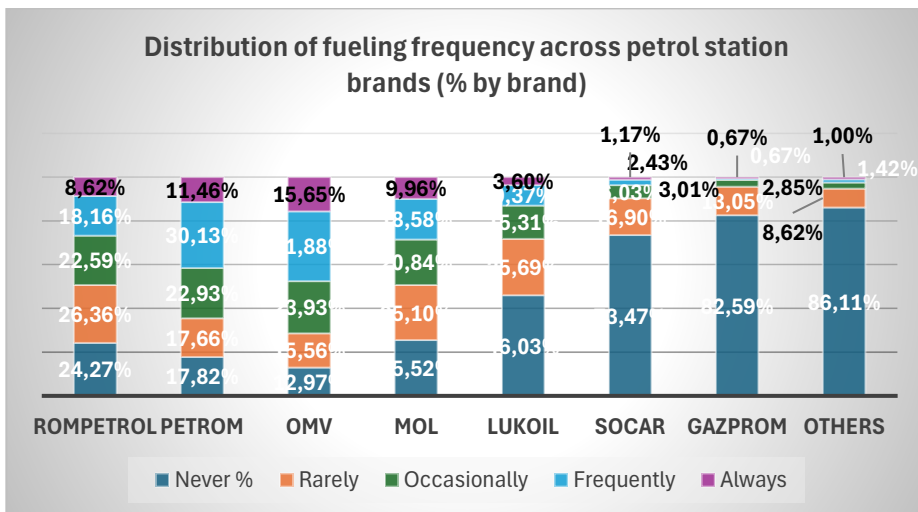


Figure 1. Distribution of fueling frequency across petrol station brands (percentage by brand)

Source: Authors' own processing based on survey data (2025)

As illustrated in Figure 1, OMV and Petrom show the highest combined proportions of frequent and always responses, suggesting stronger customer retention and habitual use. Rompetrol and MOL display a more balanced pattern, indicating moderate loyalty and a greater share of occasional customers. In contrast, SOCAR, Gazprom, and the others category register predominantly never responses, confirming their limited market penetration and brand familiarity in Romania.

These results suggest that brand loyalty in the fuel retail sector is largely driven by convenience, brand recognition, and perceived fuel quality, with OMV and Petrom maintaining clear competitive advantages in terms of consistent usage and customer preference.

Building on these results, the following section examines the level of satisfaction associated with each petrol station brand, in order to explore the link between usage frequency and customer loyalty.

Figure 2 illustrates the average satisfaction level associated with each major petrol station brand in Romania, alongside the number of respondents who most frequently refuel at these brands. OMV and MOL record the highest satisfaction scores (4.43 and 4.39, respectively), while “Other” brands show a notably lower rating (3.64), reflecting weaker perceived service quality and customer experience.

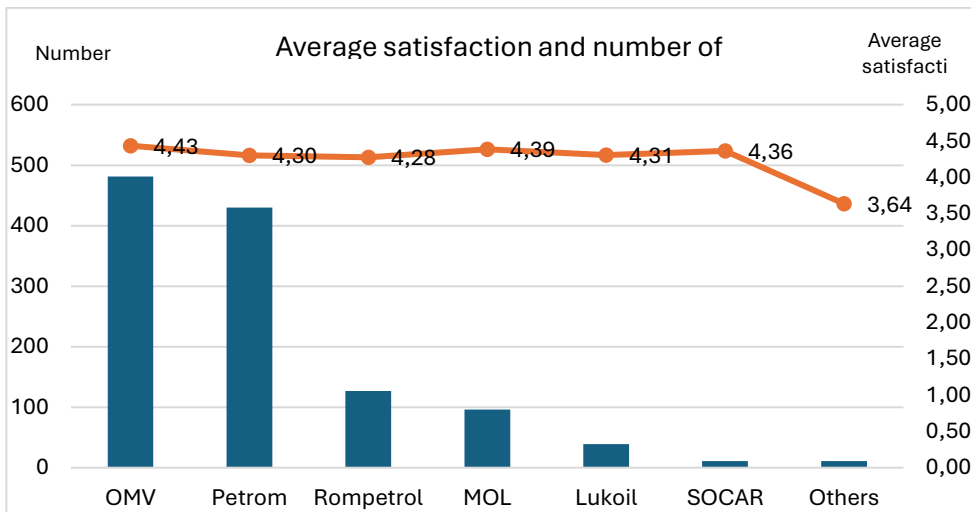


Figure 2. Average satisfaction and number of respondents by petrol station brand in Romania

As illustrated in Figure 2, OMV and MOL are the brands most frequently preferred by Romanian drivers and also record the highest satisfaction levels, with mean scores of 4.43 and 4.39, respectively, on a 5-point scale. Petrom and Rompetrol follow closely, suggesting that these four brands dominate the local market in terms of both visibility and perceived service quality.

The relatively lower average satisfaction observed for smaller or less established brands (e.g., “Other” stations, 3.64) indicates that strong brand reputation and nationwide

coverage contribute significantly to customer experience. This result reinforces prior research showing that service consistency, loyalty programs, and perceived fuel quality are critical determinants of satisfaction in the petroleum retail sector (e.g., Han et al., 2017; Ghosh & Ghosh, 2020)

Moreover, the high satisfaction scores associated with leading brands highlight the increasing importance of experiential and relational factors—beyond fuel price alone—in shaping customer attitudes within emerging markets such as Romania.

Given that customer satisfaction is widely recognized as a strong predictor of brand loyalty, the following section explores whether the most appreciated fuel station brands also exhibit higher levels of consumer attachment and repeat patronage. Figure 3 presents the distribution of loyalty dimensions across brands, offering additional insight into how satisfaction may translate into sustained behavioral intentions among Romania drivers.

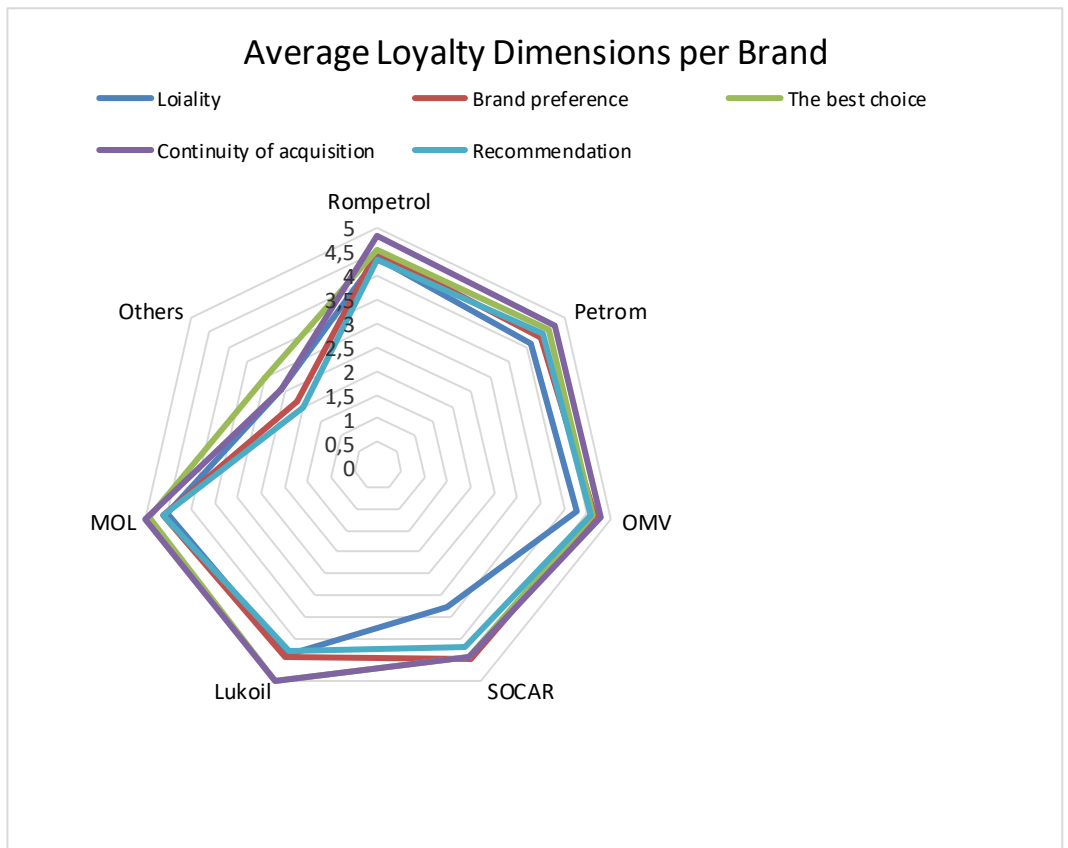


Figure 3. Average loyalty dimensions across petrol station brands

As illustrated in Figure 3, the radar chart reveals that OMV, Petrom, and MOL show the highest overall loyalty profiles across all five dimensions, with average values above 4

on a 5-point scale. These brands demonstrate strong customer attachment and behavioral intentions, such as continued patronage and positive word-of-mouth recommendations.

Rompetrol records slightly lower yet consistent loyalty levels, while Lukoil, SOCAR, and other minor brands display more irregular and generally weaker loyalty patterns. This suggests that brand reputation, network accessibility, and service experience play a critical role in sustaining consumer loyalty in the Romanian fuel market.

The similar shapes of the OMV, Petrom, and MOL profiles indicate a mature competitive environment, where differentiation may rely increasingly on relational marketing and perceived service quality rather than price alone.

5. Conclusions

This study explored the main determinants of Romanian drivers' loyalty towards petrol station brands, offering empirical evidence from an emerging market context. The results confirm that satisfaction, perceived service quality, and brand reputation are central drivers of loyalty. Among all evaluated brands, OMV and MOL exhibit the highest average satisfaction and loyalty levels, suggesting that these companies successfully combine service quality with emotional engagement. Petrom and Rompetrol follow closely, indicating that the Romanian fuel retail market is dominated by a few strong players with consistent service standards.

The findings extend existing loyalty models—originally developed in mature markets—by validating their applicability in the context of an emerging European economy. The results demonstrate that cognitive, affective, and behavioral loyalty dimensions (as proposed by Oliver, 1999) remain interrelated and stable even in markets where brand choice is often price-driven. This reinforces the argument that, beyond utilitarian motives, relational and experiential factors play a crucial role in shaping customer retention. Furthermore, the study contributes to the limited body of literature on fuel retailing in Central and Eastern Europe, emphasizing that satisfaction-loyalty mechanisms are highly consistent across cultures when service reliability and perceived fairness are ensured.

For fuel retailers, the results highlight the strategic importance of building long-term emotional bonds rather than relying solely on transactional incentives such as price discounts. Managers should prioritize consistent service quality, transparent communication, and digital innovation. Personalized loyalty programs—based on behavioral data and mobile integration—can strengthen emotional attachment and reinforce switching barriers. Additionally, sustainability practices, such as carbon offset initiatives or renewable energy use at petrol stations, can enhance brand differentiation and attract environmentally conscious consumers.

While the present study provides robust insights, it is limited by its cross-sectional design and self-reported data, which may not fully capture long-term behavioral patterns. Future research could employ longitudinal methods or cross-country comparisons within the CEE region to test whether the satisfaction-loyalty relationship evolves over time or differs across national contexts. Moreover, integrating variables such as perceived sustainability, digital engagement, or green trust would offer a more comprehensive understanding of brand loyalty in the evolving energy and mobility ecosystem.

Overall, this research demonstrates that even in a highly competitive and price-sensitive market such as Romania, customer loyalty is primarily shaped by experiential and relational factors. Strengthening these dimensions may represent the key to sustainable growth for fuel retailers operating in emerging economies.

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AI AND DECISION MAKING PROCESS: EXPLORING RESEARCH AND THEORIES

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Abstract: *The importance of technology to the decision-making process is already high, with artificial intelligence playing an increasing role. Due to the advantages of using AI in the decision-making process, more and more companies are incorporating it. Increased accuracy, faster decision making, improved efficiency, better risk assessment and mitigation, data-driven insights, are some of the valuable benefits for decision makers, but companies must also consider the challenges they must face with AI integration. While the AI-informed decisions are increasing, fully autonomous AI decisions are still an exception. Decision makers using the same AI recommendations may make different decisions, so personal human involvement is still important. The AI's power today is obvious, the companies must strive to have more advanced AI, but at the same time the human decision-maker will be the one to decide which decisions will be made completely by AI and which with the help of AI. More than that, companies must develop strategies for how and when to use AI tools. This study aims to analyze the interest of specialists in investigating topics related to artificial intelligence in decision making. To carry out the study, we investigated the specialized literature from the Scopus database, in the period 2015-2025. The software applications we used were Microsoft Excel and VOSviewer. The major objective of the performed analysis is the research of the scientific productivity of the literature focused on the subject we investigated.*

Keywords: *artificial intelligence; decision making; AI-informed decision; fully autonomous AI decision; benefits; challenges.*

JEL classification: *M50; M54.*

1. Introduction

Artificial intelligence (AI) represents one of the most important technological revolutions of our century, having a direct impact on the way we live, work and interact. AI has a great capacity to analyze huge volumes of data in a very short time, to take over repetitive or complex tasks, to personalize information and provide solutions for each user. Therefore, AI becomes an engine of competitiveness, helping companies reduce costs, optimize processes and create added value for society. Given the rapid and continuous changes, organizations that adopt artificial intelligence certainly become more adaptable. Demographic changes and the lack of qualified personnel have led global corporations to reevaluate their business practices to achieve efficiency and remain competitive. (Roppelt et al., 2025)

In a constantly changing world, the ability to make informed, balanced and ethical decisions is one of the most important skills of any manager. The success of a business is never accidental, but is the result of good decisions, made in a competitive and often unpredictable environment. Therefore, decision-making is an essential process that influences the future of the entire organization, both in an international corporation and in a small business. As the foundation of economic performance, decisions directly influence the profitability and sustainability of a business. Theoretically, the manager must analyze all the options and choose the optimal option. In practice, it is difficult, if not impossible, for the decision maker to analyze all the options. Moreover, the decision maker is not completely rational. Decisions are affected by cognitive biases, such as: anchoring - the first information received is of great importance, overconfidence bias - exaggerated confidence in one's own knowledge, loss aversion - the fear of losing is stronger than the desire to win. (Kahneman, 2015) In addition, emotions play an essential role in decision-making. They are not simple subjective reactions, but indispensable components of the rational decision-making process. Recognizing and managing emotions leads to more balanced decisions. However, the decision-making processes can be enhanced by Artificial Intelligence. (Punzi et al., 2023). A good decision requires rapid access to a large volume of accurate information and the ability to quickly evaluate multiple scenarios. AI also offers an increased level of objectivity; it can diminish the influence of human bias, supporting a fairer and more rational decision-making process. But human involvement is still important; humans cannot be completely replaced.

The best approach is to establish hybrid systems in which humans and artificial intelligence work synergistically. This way, the strengths of both humans and artificial intelligence will be capitalized. (Akata et al., 2020)

The interaction between artificial intelligence and human decision-makers is becoming stronger, with the number of managers using recommendations generated by artificial intelligence in the decision-making process continuously increasing. Therefore, it is now common for artificial intelligence to assist human experts in a variety of tasks of major importance. (Carter, 2025)

Hybrid decision-making systems (HDMS) consist of human and mechanical agents, which can collaborate in various ways. (Punzi et al., 2023; Cummings, 2014) These cooperations are encountered in the current context in various fields of activity (business, medicine, finance, security). HDMS presents significant advantages, while also involving certain challenges.

From one perspective, the use of hybrid decision-making systems could bring advantages such as:

AI quickly analyzes large volumes of data, and humans add experience, context, and ethical judgment.

AI can detect patterns invisible to humans, and humans can validate the results to avoid algorithmic errors.

AI proposes scenarios, and the decision-maker chooses based on the context, making the system more flexible.

Human involvement increases the degree of acceptance of the decision in organizations.

In sensitive areas such as medicine, the military, and justice, people can stop or adjust automated decisions if necessary; this way critical situations are better managed.

From another perspective, HDMS may face some challenges:

Integrating AI into decision-making processes requires advanced technologies and training, which means high costs

There may be conflicting opinions between AI and human decision-makers

Clear rules are needed regarding priority when the opinions of the two agents are different

Human decision makers may have biases that can alter the decision.

There is a possibility that humans will rely too much on AI and thus the balance may be compromised

Considering the level of physical control, the degree of monitoring and the human intervention, (Merat et al., 2018) approach three types of collaboration between humans and artificial intelligence:

Human-in-the-loop

Human-on-the-loop

Human-out-of-the-loop

Human-in-the-loop (HITL) is an interaction model in which the ultimate control belongs to the human; the automated decision cannot be implemented without the explicit approval of a human operator. (Li, Nianyu et al., 2020)

Human-on-the-loop (HOTL) is a supervision model in which humans can intervene if they detect errors or unwanted behaviors; humans exercise control through monitoring, but do not approve every decision.

Human-out-of-the-loop (HOOTL) is a model in which humans are excluded from the decision-making process, and the system operates with full autonomy, without direct supervision or the possibility of human intervention.

The three models of human involvement illustrate a spectrum of interactions between humans and machines, from direct control to full autonomy. The HITL model is more present in areas such as health or justice, where responsibility and ethical implications are essential; the HOTL model are increasingly prevalent in contexts that require efficiency and rapid reactions, but retain human oversight mechanisms, while HOOTL systems are less common for now, raising ethical challenges.

AI brings an undeniable increase of efficiency in decision-making process, but it does not eliminate the need for the human factor. The most viable decision-making model in the near future seems to be the hybrid one, with the human role shifting from actual decision-making to supervision. Responsible integration of AI into society can contribute to the development of more efficient, safer and fairer systems, transforming the way people make decisions and take actions.

2. Research methodology

In our research we investigated the interest of the specialists towards the use of artificial intelligence in the decision-making process, using quantitative analysis of scientific production in this field.

The research objectives:

Finding of the evolution of the interest in the field of research

Finding the journals with the most scientific productivity and impact in the field of research

Finding the most consulted papers in the field of research

Finding the countries with the largest number of published articles in the field of our research

The research conducted is based on a bibliometric analysis of studies related to the use of artificial intelligence in the decision-making process.

“Bibliometric analysis is an increasingly popular and thorough technique for examining and assessing massive amounts of scientific data, which is being used more and more in research.” (Passas, 2024)

“Bibliometric analysis has recently become a popular and rigorous technique used for exploring and analyzing the literature in business and management.” (Öztürk, Kocaman & Kanbach, 2024)

Statistical methods play an important role in the analysis of the field of research. But their relevance depends on the clarity of reporting. According to this, the PRISMA methodology brings rigor, transparency and clarity to the process of conducting and reporting systematic reviews.

“The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework is a widely recognized methodology for conducting and reporting systematic reviews and meta-analyses.” (Teixeira, Ferreira & Ramos, 2025)

By using PRISMA methodology we can improve analysis based on statistical methods. Therefore, this research follows the PRISMA methodology for systematic reviews. Inclusion and exclusion criteria are presented in Table 1.

Table 1. Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
It must explore at least one topic related to artificial intelligence in the decision-making process reflected by the title or the abstract of the paper;	Papers containing the terms “artificial intelligence” and „decision making process” in authors’ keywords section but in reality, the papers main topic was about something else;
Papers released between 2015 and 2025;	Book, book chapter, letter, conference review, editorial, note, short survey;
Journal and Conference Proceedings;	
The papers are written in English	

Scopus is one of the most important bibliographic databases. For this reason, we used it to collect the data necessary for the research. The data were collected in June 2025. For the selection of in the field of interest we used the following search algorithm: TITLE-ABS-KEY (artificial intelligence) AND TITLE-ABS-KEY (decision making process)) and we have obtained 20.452 results.

By filtering the results in the following way: Year: 2015-2025; Source Type: Journal and Conference Proceeding; Document type: Article, Review and Conference Paper; Subject Area: Business, Management and Accounting, Economics, Econometrics and Finance; Language: English we obtained a number of 1.161 results.

In the next step, we excluded the inconclusive journals for the field of interest and we obtained 1107 results. Finally, we analyzed the articles evaluating the title and keywords and retained 1059 papers in the database.

3. Data analysis

In the data analysis process, we used the tools of the Microsoft Excel and VOSviewer applications. The results of the data analyses carried out in accordance with the research objectives are presented below.

Number of articles by year (2015-2025) - evolution of the interest for artificial intelligence in the decision-making process topic (Figure 1).

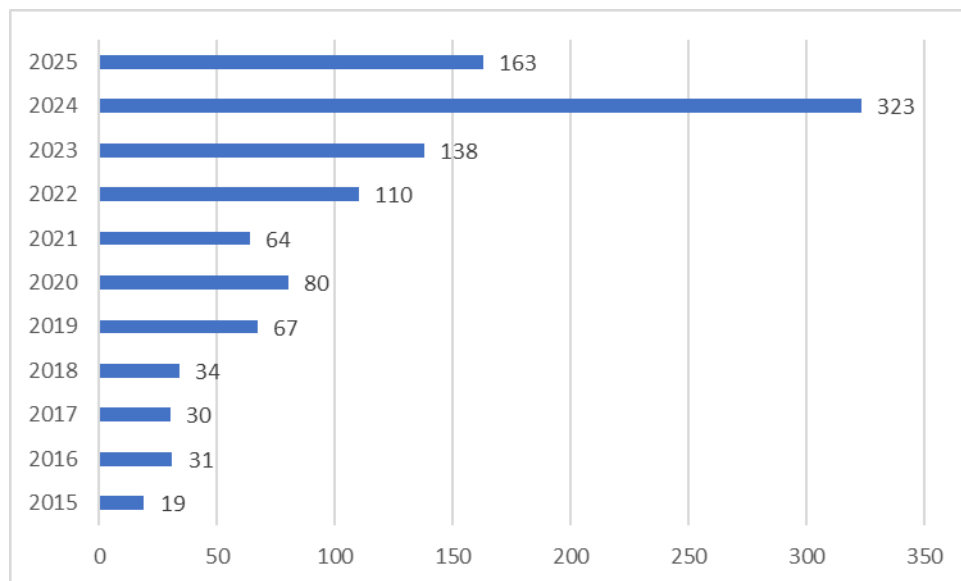


Figure 1: Number of articles by year

Source: own representation

From figure 1, we can see that in the period 2015-2018, the interest in the topic artificial intelligence in the decision making process is still low. Starting with the year 2019, interest starts to grow. Thus, in the year 2019 the number of published articles is double that of the year 2018, and in the year 2023 it is double that of the year 2019. But, a significant increase in the approach to this topic occurs only in the year 2024. Interest is maintained throughout the year 2025. Thus, in the first 6 months of the year, the number of published articles is half of the number of articles published in the year 2024.

Scientific productivity by journal - top 10 journals that contain papers with topic: artificial intelligence in the decision making process (Figure 2).

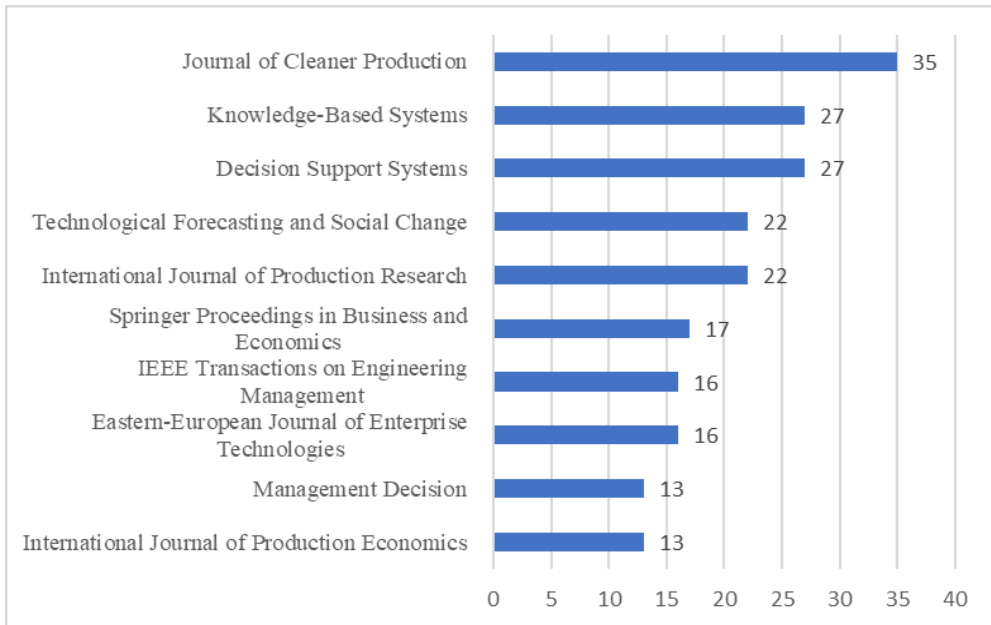


Figure 2: Scientific productivity by journal: number of articles published

Source: own representation

Impact by journal: Total number of citations by journal

In figure 3 we can see the journals, whose articles published in the field of interest, have the largest number of citations. The journals with more than 400 citations were included.



Figure 3: Total number of citations by journal

Source: own representation

In table 2 we can see the first ten journals with the most cited articles in the field of interest.

Table 2: Top 10 journals with the most cited articles.

Journal name	Total number of citations
International Journal of Information Management	2958
Knowledge-Based Systems	1828
Business Horizons	1801
Journal of Cleaner Production	1585
International Journal of Production Research	1565
Technological Forecasting and Social Change	1048
Decision Support Systems	784
International Journal of Production Economics	762
Business Process Management Journal	616
Journal of Business Research	583

Source: own representation

Impact by journal: Average number of citations by year

The articles in the field of interest are published in different years. For this reason, we also calculated the average number of citations per year. In figure 4 we can see the journals, whose articles published in the field of interest, have the largest average number of citations per year. The journals with more 80 average number of citations were included.

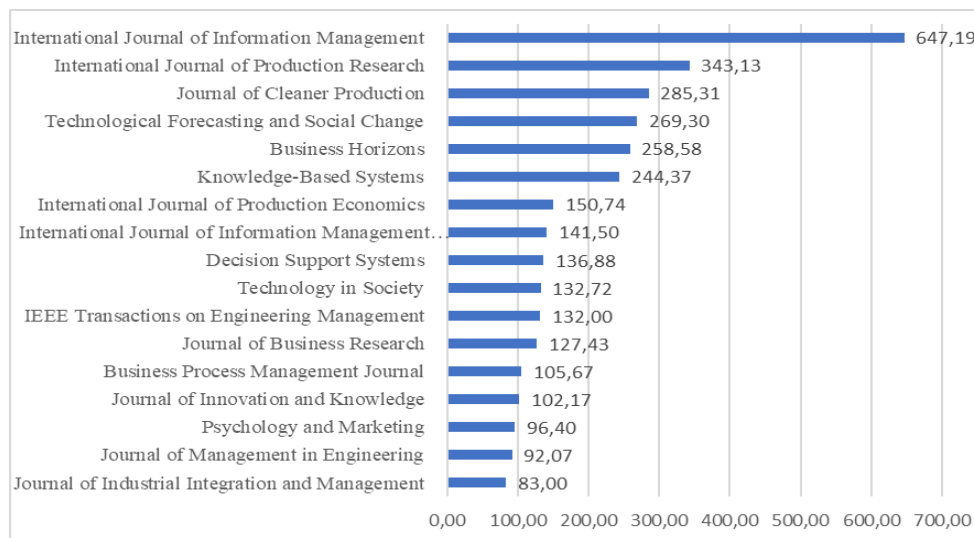


Figure 4: Average number of citations/years

Source: own representation

In table 3 we can see the first ten journals with the highest average number of citations per year for articles in the field of interest.

Table 3: Top 10 journals with the highest average number of citations/years

Journal name	Average number of citations/years
International Journal of Information Management	647,19
International Journal of Production Research	343,13
Journal of Cleaner Production	285,31
Technological Forecasting and Social Change	269,30
Business Horizons	258,58
Knowledge-Based Systems	244,37
International Journal of Production Economics	150,74
International Journal of Information Management Data Insights	141,50
Decision Support Systems	136,88
Technology in Society	132,72

The most cited articles in the field of interest - the articles with great impact.

To measure the impact, we considered the total number of citations per article. In table 4 we can see the articles published in the field of interest, with the highest number of citations. We presented in the table the first five articles in terms of the number of citations obtained.

Table 4: The most cited articles: total number of citations

Title	Authors	Journal	Year of publication	Number of citations
Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy	Dwivedi et al.	International Journal of Information Management	2021	2308
Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making	Jarrahi M.H.	Business Horizons	2018	1251
Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects	Wamba-Taguimdje et al.	Business Process Management Journal	2020	607

Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice	Syam & Sharma	Industrial Marketing Management	2018	538
Consensus reaching in social network group decision making: Research paradigms and challenges	Dong et al.	Knowledge-Based Systems	2018	484

Source: own representation

From table 4, we can see that the most cited article was published in International Journal of Information Management, in year 2021. The number of citations is almost double that of the next ranked one and was obtained within an interval of approximately 5 years.

To measure the impact we considered also, the average amount of citations/year per article. Searching our database for the articles with the highest average citations per year (table 5), we find that the first 3 articles are the same as in table 4. The following ranked articles are published three and four years ago.

Table 5: The most cited articles: average number of citations/years

Title	Authors	Journal	Year of publication	Average nr of citations by year
Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy	Dwivedi et al.	International Journal of Information Management	2021	461,60
Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making	Jarrahi M.H.	Business Horizons	2018	156,38
Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects	Wamba-Taguimdje et al.	Business Process Management Journal	2020	101,17

A systematic literature review of artificial intelligence in the healthcare sector: Benefits, challenges, methodologies, and functionalities	Ali et al.	Journal of Innovation and Knowledge	2023	99,67
Artificial Intelligence Applications for Industry 4.0: A Literature-Based Study	Javaid et al.	Journal of Industrial Integration and Management	2022	83,00

Source: own representation

Number of articles by country

In table 6 we can see the countries with the largest number of published articles in the field of our research.

Table 6: Number of articles by country (2015–2025)

Country	Number of papers	% of total (1059)
United States of America	157	14,83%
China	124	11,71%
India	120	11,33%
United Kingdom	84	7,93%
Germany	72	6,80%
Italy	62	5,85%
Australia	56	5,29%
France	53	5,00%
Spain	47	4,44%
Portugal	34	3,21%
Ukraine	34	3,21%
Canada	31	2,93%
Total	874	82,53%

Together, they represent 82,53% of the total number of articles published in the field of our research. The United States of America is the country with the largest number of published articles (157 papers, 14,83% of the total number of articles in our database), followed by the China (124 articles), India (120 papers), United Kingdom (84 articles) and Germany (72 articles). These five countries represent more than half (52,6%) of the total number of articles included in our database.

In Figure 6 we can see the graphic representation obtained with the VOSviewer application.

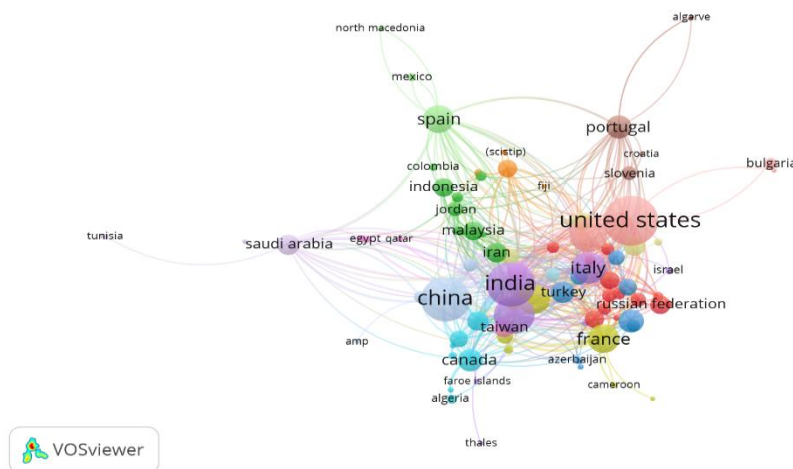


Figure 6: Number of published articles by country
Source: own representation

4. Conclusions

Artificial intelligence is profoundly transforming the way decisions are made, delivering efficiency, accuracy, and the ability to handle complex data at a rapid pace, exceeding the limits of traditional human reasoning. This change also brings important challenges related to ethics, transparency and accountability, especially when the human role in the decision-making process diminishes. However, maintaining a balance between automation and human control remains essential, as technology's role grows. Currently, the “human on the loop” model is predominant, as it allows for general human control over automated processes without limiting their efficiency. Less commonly used, “human in the loop” remains relevant in areas where risks are high or where ethical and contextual validation of decisions is needed. In the long term, however, the trend is clearly oriented towards a gradual transition to “human out of the loop”, where complete autonomy is safer and more efficient. The future of decision-making lies in finding a balance between human reasoning and artificial analysis – a model in which technology does not replace human judgment, but complements and amplifies it, ensuring safer, fairer, and more efficient decisions.

Our research results show that, of the 1059 articles selected in the database, almost 70% were published in the last three and a half years. This fact highlights the increasing interest of specialists for artificial intelligence in the decision making process topic in recent years. A significant increase in the approach to this topic occurs in the year 2024. Interest is maintained and throughout the year 2025.

According to the results of the research carried out, the journals with the largest number of articles on the artificial intelligence in the decision making process topic are: Journal of Cleaner Production, Knowledge-Based Systems, Decision Support Systems. The journals with the most cited articles in the field of interest are: International Journal of Information Management, Knowledge-Based Systems, Business Horizons. Also, he

countries with the largest number of published articles are: United States of America, China, India, United Kingdom and Germany.

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ROMANIA'S LABOUR MARKET EXPOSURE TO AI

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Abstract: *New technologies are significant drivers of contemporary social transformations. These changes often lead to predictions about the future of jobs, primarily based on historical analogies and ideological suppositions. In addition to theoretical perspectives, the impact of artificial intelligence (AI) on the labour market is rigorously analyzed empirically, through task and skill assessments aimed at forecasting the future of work. We wish to extend these empirical methods to the Romanian labour market, using a model based on composing activities exposure evaluation within each occupation. Present research does not measure the impact of AI on labour market or predict the future of jobs or of employment. It measures the potential impact of AI to labour market by measuring its exposure, meaning the degree to which occupations or specific tasks within those occupations are likely to be affected by the present capabilities of artificial intelligence technologies. The results show that due to large employment numbers within occupations with low AI exposure scores, the average weighted AI exposure score for Romanian market, 6.75, is below the mean value of 6.81 and below the EU level of 6.79. By analyzing the evolution of high exposure occupation groups, presuming that automation and AI solutions are being applied, we can conclude that there is no correlation between AI exposure and employment trends on Romanian labour market. The study emphasizes the asymmetric impact of AI on different economies, depending on the structure of their labour market. The analysis does not indicate the existence of a substitution or complementation effect.*

Keywords: artificial-intelligence; automation; labour-market; employment; exposure.

JEL Classification: J21; O33

1. Introduction

The history of work has evolved along with that of humanity. From agricultural societies, through more organized forms within city states, to Fordism and today's digital Taylorism (Staab, 2017), work has been continuously transformed by technological advancements. Early industrial revolution deskilling was succeeded by a twentieth-century demand for skilled labour due to technological evolution. Now, artificial intelligence (AI) poses a new threat of deskilling. AI, with its promise of being the new general-purpose technology, predicts a broad impact across the economy, leading to significant productivity gains and societal changes. AI, while promising for increased productivity, also raises concerns about the future of jobs. There is concern not only about job displacement but also about the transformation of jobs. AI may drive automation in various labour-intensive sectors of the economy, potentially challenging the role of labour as a key production factor (Leontief, 1982). The potential impact of AI on labour market is being analyzed by scholars, who are confronted with the dynamic

evolution of technology. The new capabilities of AI that enter deeply into the cognitive domain, agents, and co-inventions needed for applicability are constantly rewriting previous estimations. Existing research on the topic introduces new methods for measuring occupation's exposure to AI, defines and calculates AI exposure indicators. By analyzing occupations as a sum of different tasks, it became possible to quantify the susceptibility of various occupations to computerization. The advantage of occupation level analysis is that it can be combined with occupational data at sector or national level, making possible more applied research. A country's innovation system plays a crucial role in mediating AI's impact of AI on employment and economic growth, highlighting the context-dependent nature of AI's impact and challenging the notion of AI as universally beneficial or harmful (Guarascio and Reljic, 2025). Studies focus on occupational structures, estimating the automation potential of tasks or skills that characterize a given job, and linking these classifications to official labour market statistics to understand global, regional, and income-based differentials. The primary value of these studies was to facilitate understanding the potential trajectories of change. This understanding aids in the creation of suitable policy responses and offers valuable insights to governments and social partners, enabling them to formulate policies that promote equitable and collaborative transitions towards the future of work. This study examines the AI exposure of occupations based on composing activities within each occupation, particularly applied to the Romanian labour market. The study emphasizes the asymmetric impact of AI on different economies, based on their automation level and labour market structure. After determining AI exposure at the national and occupational levels, we were able to verify the correlation between AI exposure and annual employment growth. This may suggest that AI, at least until now, is more likely to be uncorrelated with employment trends. While the implementation of our methodology is similar to that of Felten (2021) and of Gmirek et al. (2023), we rely on different occupational activities AI exposure determination method. Ultimately, it provides a detailed ranking of occupations by their estimated probability of being automated, and a correlation analysis between AI exposure and employment evolution data.

2. Literature review

The problematics of technological unemployment, due to technological change, is dated more than 300 years ago. In 1812, Lord Byron discussed the protests of Luddite against knitting frames in the House of Lords (Leontief, 1982). In 1930, Keynes (1930) predicted a fifteen-hour workweek, and Leontief, in 1982 expressed his fear on human labour future status, which would not be the principal factor of production (1982). The relationship between humans and machines is changing and is continuously being challenged by the evolution of AI. The way that technological change reshapes labour market is described by two main theories, Skill Biased Technical Change (SBTC) and Routine Biased Technological Change (RBTC). The first hypothesis, SBTC, assumes that new technologies will benefit high-skilled workers, whereas low-skilled workers will be substituted (Acemoglu and Autor, 2011). It consists of an upskilling of occupations, contrary to the deskilling observed during the Industrial Revolution, when artisanal workers were replaced by machines. The upskilling effect is present in SBTC along with

skill-biased theory, assuming that high-skilled workers are keener to use advanced technologies (Tinbergen, 1974). RBTC focuses on tasks, on how technology affects specific tasks rather than skills (Autor et al., 2003). The tasks categorized as routine are assumed to be susceptible to automatization, while non-routine tasks are less susceptible. Shifting from skills to tasks opens the perspective of a more detailed analysis of how capital becomes capable of performing different tasks using technology. Automation could substitute for labour, but it could complement it, generating higher output and, consequently, higher labour demand (Autor, 2015). The susceptibility of jobs to automation has been analyzed and measured mainly through their composing tasks or required skills using task or skill models (Autor et al., 2003). Frey and Osborne (2017) used a similar task model to calculate the probability of computerization at the occupational level, emphasizing creativity and social intelligence, as skills assessed as non-susceptible to computerization. Prior work on quantifying exposure to AI introduces a "suitability for the machine learning" (SML) metric and analyses its distribution across occupations and tasks (Brynjolfsson et al., 2018). Different automation exposure scores are present in literature as Mean Automation Score (Gmyrek et al., 2023), AI Occupational Exposure, AI Industry Exposure and AI Geographic Exposure indicator (Felten et al., 2021). These metrics link common AI applications to workplace abilities, enabling the assessment of potential impacts on various sectors. Similar indicators are Generative Artificial Intelligence (GenAI) and Language Modelling (LM) Occupational Exposure Scores (Nurski and Ruer, 2024), GPT Exposure Rating (Eloundou et al., 2023), without having one accepted as standard. These indicators do not predict and remain neutral on whether AI substitutes or complements labour but are perceived as disruptive signs, even if studies reveal growth in employment figures for AI-exposed occupations (Guarascio and Reljic, 2025). One weakness of these indicators is their focus on relatively near-term opportunities, which may need to be updated as AI as technology evolves.

3. Methodology

The present research aims to measure the Romanian labour market's exposure to AI. It does not attempt to indicate what will happen in the future with certain jobs, nor whether AI will complement or substitute for labour, but rather how exposed the occupation is to AI. This methodology involves calculating the AI's ability to replace human work. The starting point was the Occupational Information Network (O*NET), a database developed for the U.S. Department of Labour, which consists of detailed descriptions of work. O*NET provides 41 different work activities for each occupation and is associated with a scale of importance (0-5) and relevance (0-7). To determine the ability of AI to perform these activities instead of humans, having a repetitive task, we built an agent based on AI reasoning models GPT-4o and DeepSeek-R1 to evaluate on a scale from 1 to 10 the ability (A) of AI to replace human work and to reason each value generated. GPT-4o, developed by OpenAI, excels in handling complex reasoning tasks and is easily integrated due to its APIs. Similarly, DeepSeek-R1, developed by a Chinese AI startup owned by High-Flyer hedge fund, offers comparable flexibility, is more cost-effective, and performs well in reasoning tasks. This method has been previously described by Eloundou (2023). The tool used was n8n, a free and open node-based

workflow automation tool connected to an AI agent via API calls. The logical structure of the agent is illustrated in Figure 1.

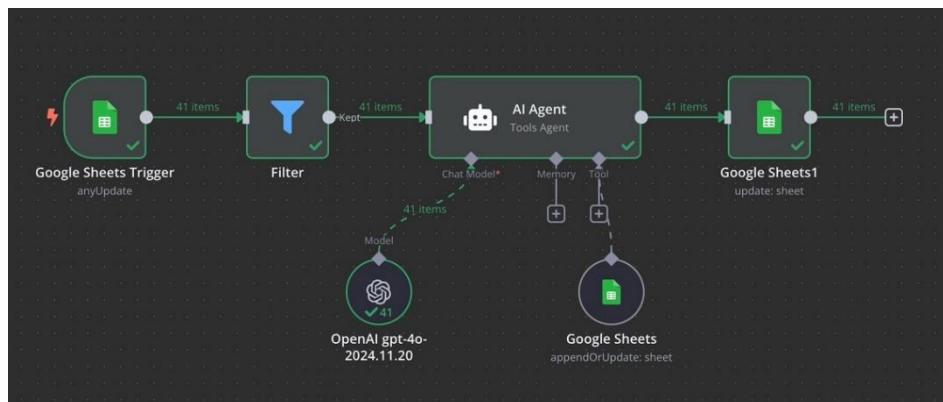


Figure 1: AI Agent structure
Source: Adapted from n8n.io

The reasoning capabilities of these models are measured by the Massive Multitask Language Understanding (MMLU) benchmark. According to MMLU's developers, the human experts achieve 0.898 accuracy (Hendrycks *et al.*, 2021), while GPT-4o has a score of 0.843 and DeepSeek R1 reasoning model achieved 0.872 ('MMLU - Holistic Evaluation of Language Models (HELM)', 2025). The scoring and associated reasoning examples are presented in Table 1.

Table 1: Activities' AI Ability Score and Reasoning

Element Name	AI Ability Reasoning DeepSeek R1	AI Ability Reasoning GPT-4o
Analyzing Data or Information	**Overall Value: 9**: AI excels at analyzing large datasets, identifying patterns, and performing statistical operations with speed and accuracy beyond human capability. It automates repetitive tasks, handles complex algorithms, and generates insights efficiently. However, it may lack nuanced contextual interpretation or creativity in ambiguous scenarios, requiring human oversight for strategic decision-making. For most data-driven tasks, AI is a near-perfect substitute.	9 - AI has a strong capability to analyses large datasets, identify patterns, and extract insights far more quickly and accurately than many humans. However, it may still require human oversight to contextualize findings, validate interpretations, or handle nuanced real-world complexities.

Element Name	AI Ability Reasoning DeepSeek R1	AI Ability Reasoning GPT-4o
Making Decisions and Solving Problems	**Overall Value: 7** : AI excels in structured, data-driven decision-making and problem-solving tasks (e.g., logistics optimization, pattern recognition) due to its ability to process vast datasets and identify trends quickly. However, it struggles with abstract reasoning, ethical nuance, creativity, and novel scenarios lacking historical data. While it can augment human judgment in many domains, it remains limited in contexts requiring emotional intelligence, moral reasoning, or adaptability to entirely new challenges.	8 - AI demonstrates strong analytical capabilities, logical reasoning, and data-driven decision-making, making it effective at solving structured problems and assisting in decision-making. However, it lacks human intuition, emotional intelligence, and creativity in ambiguous or highly nuanced situations, which limits it as a complete substitute for humans.
Thinking Creatively	**Overall Value: 7** : AI demonstrates significant ability to generate novel ideas, solve problems unconventionally, and mimic creative processes by leveraging vast datasets and pattern recognition. Tools like generative models produce art, stories, and solutions that often appear innovative. However, AI lacks intrinsic motivation, emotional depth, and consciousness, limiting its capacity for true originality or creativity rooted in lived experience. It excels as a collaborative tool but cannot fully replace human creativity's intuitive, context-aware, and meaning-driven aspects.	6 - While AI demonstrates a strong ability to generate innovative ideas, its creative thinking is largely based on patterns, data, and existing knowledge. It lacks true originality, emotional depth, and the intuitive spontaneity that humans bring to creative thought.

Source: O*NET data processed by OpenAI GPT-4o and DeepSeek-R1

To assess whether the differences in the scores between GPT-4o and DeepSeek-R1 were statistically significant, we performed a paired t-test. The t-statistic was approximately 3.51, and the p-value was approximately 0.00114. This indicates a statistically significant difference between the two AI ability scores at conventional levels (< 0.05), assuming that the assumptions of the paired t-test are met. The correlation coefficient between DeepSeek-R1 and GPT-4o was 0.7436, indicating a strong positive correlation between the ability scores of the two AI models. This means that when DeepSeek-R1 scores higher on a particular element, GPT-4o also tends to score higher and vice versa. This strong positive correlation suggests that both AI models generally agree on which elements they perform better or worse, although there are still some

differences in their specific scoring patterns. The resulting AI ability level, as the mean of the two scores, was used to calculate our key variable using the occupational AI exposure indicator (Felten *et al.*, 2021):

$$AIE_k = \frac{\sum_{j=1}^{41} A_j \times L_{jk} \times I_{jk}}{\sum_{j=1}^{41} L_{jk} \times I_{jk}} \quad (1)$$

The ability A of the AI to perform different activities (*j*) is weighted by the importance (*I_{jk}*) and prevalence (*L_{jk}*) within each occupation (*k*). The resulting AIE exposure indicators for the 349 occupations were analyzed using descriptive statistics. Conversion to the European Skills, Competences, Qualifications, and Occupations (ESCO) classification system developed by the European Commission was performed using the O*NET-SOC 2019 Crosswalks database. To extrapolate the results on the Romanian labour market, we used employment data up to 2023 by the International Standard Classification of Occupations 2008 (ISCO-08) 2-digit codification published by Eurostat. A regression analysis was conducted to assess the correlation between AI exposure scores and changes in employment.

4. Results and discussions

4.1. Activity level analysis

The analyzed 41 activities defined by O*NET generate AI Ability scores within a minimum of 3 for Performing General Physical Activities and a maximum of 9 for Analyzing Data or Information and Getting Information activities, with an overall mean value of 6,695. The lowest and highest ten activities are listed in Table 2.

Table 2: AI Ability Score by activity

Activity Name	AI Ability Score
Performing General Physical Activities	3
Establishing and Maintaining Interpersonal Relationships	3,5
Assisting and Caring for Others	3,5
Repairing and Maintaining Mechanical Equipment	4
Repairing and Maintaining Electronic Equipment	4,5
Resolving Conflicts and Negotiating with Others	4,5
Handling and Moving Objects	5
Staffing Organizational Units	5
Developing and Building Teams	5,5

Activity Name	AI Ability Score
Coaching and Developing Others	5,5
Evaluating Information to Determine Compliance with Standards	8
Updating and Using Relevant Knowledge	8
Controlling Machines and Processes	8
Performing Administrative Activities	8
Estimating the Quantifiable Characteristics of Products, Events, or Information	8,5
Processing Information	8,5
Working with Computers	8,5
Documenting/Recording Information	8,5
Getting Information	9
Analyzing Data or Information	9

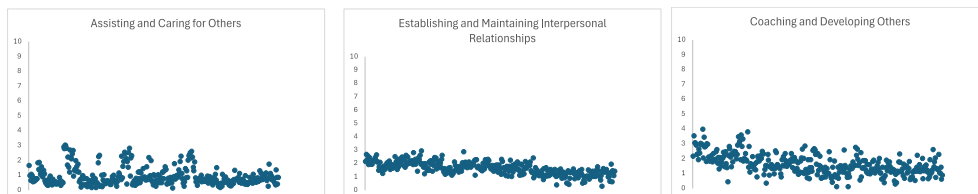
Source: O*NET data processed by OpenAI GPT-4o and DeepSeek-R1

4.2. Occupation level analysis

AI Ability Scores were applied to each activity within each occupation. By adding the importance and prevalence predefined by O*NET, we calculated the AI exposure (AIE) indicator:

$$AIE_j = \frac{A_j * L_j * I_j}{L_{max} * I_{max}} \quad (2)$$

The distribution of occupations as a function of AI exposure is illustrated in Figure 2 (activities with the lowest and highest AI ability index).



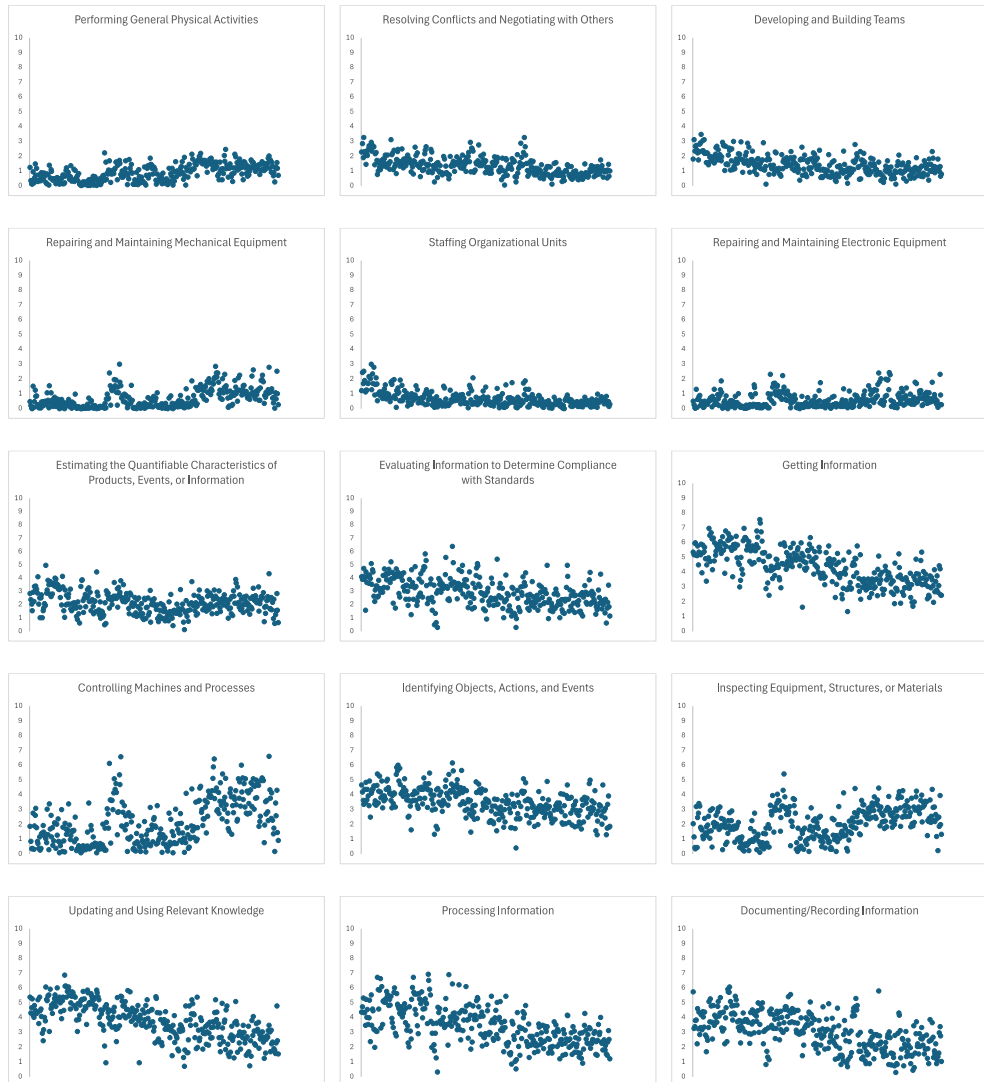


Figure 2: Occupation distribution by AI exposure
Source: Data from O*NET processed by the author.

The level of AI exposure within the occupations ranged from a minimum of 5,91 to a maximum of 7,43, with a mean of 6,81 and standard deviation of 0,2. In the box-and-whiskers plot presented in Figure 3, minimum and maximum values are outliers, while 50% of the values are between 6,67-6,96.

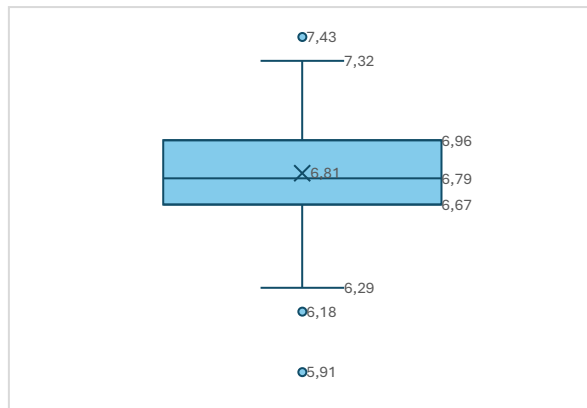


Figure 3: Occupation distribution by AI exposure
Source: Data from O*NET processed by the author.

We distinguished between high, medium, and low AI exposure by thresholding at values of 3.0 and 7.0. According to our estimates, there are no occupations without exposure to AI. 78,51% of the occupations have medium exposure, below 7, and the rest 21,49% were ranked as highly exposed to AI. It is important to mention that these figures do not clarify the meaning of exposure, whether it complement or substitute.

4.3. Romanian labour market level analysis

By weighting the obtained AI exposure scores with Romanian occupational data, we were able to determine the potential impact of AI on the labour market. As illustrated in Figure 4, most jobs have an AI exposure positioned below the mean value of 6,81. The overall weighted score is $6,75 < 6,81$, which suggests a lower exposure of the Romanian labour market than the average.

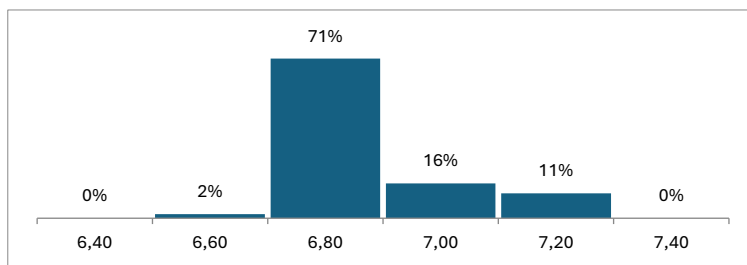


Figure 4: AI exposure across Romanian job categories
Source: Data from Eurostat and O*NET, processed by the author.
https://ec.europa.eu/eurostat/databrowser/view/lfsa_egai2d_custom_15660881/default/table?lang=en. Accession date: 17.03.2025

Jobs with high AI exposure accounted for 27% of active employment. This number is lower than that in EU countries, where high-exposure active jobs constitute 41%, as shown in Figure 5. The average AI exposure score for the EU countries was 6,79.

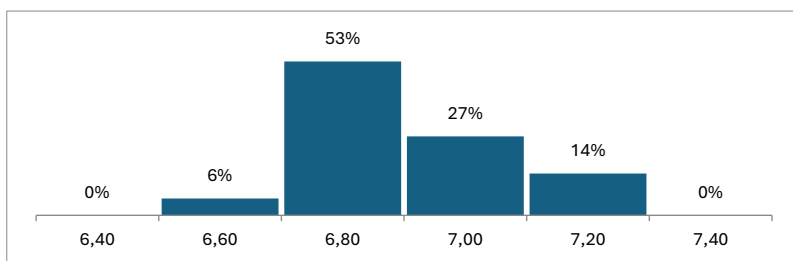


Figure 5: AI exposure across EU job categories

Source: Data from Eurostat and O*NET, processed by the author.
https://ec.europa.eu/eurostat/databrowser/view/lfsa_egai2d_custom_15660881/default/table?lang=en. Accession date:17.03.2025

At the EU level, AI exposure demonstrates a more polarized distribution, with a higher proportion of jobs exhibiting lower levels of AI exposure at 6%, compared to 2% based on Romanian data. AI exposure index for each ISCO-08 2-digit classification combined with employed persons data are presented in Table 3:

Table 3: AI exposure index

Position	AIE	Employed Persons RO 2023, % of Total	Employed Persons EU 2023, % of Total
Market-oriented skilled forestry, fishery and hunting workers	6,50	0,1%	2,6%
Cleaners and helpers	6,59	1,8%	3,2%
Building and related trades workers, excluding electricians	6,60	6,0%	3,9%
Labourers in mining, construction, manufacturing and transport	6,61	4,7%	2,7%
Personal service workers	6,61	3,5%	1,6%
Sales workers	6,61	9,6%	6,9%
Refuse workers and other elementary workers	6,62	1,7%	1,0%
Personal care workers	6,62	1,6%	3,3%
Electrical and electronic trades workers	6,64	2,0%	1,6%
Food preparation assistants	6,66	0,2%	0,7%
Protective services workers	6,67	2,7%	1,6%
Metal, machinery and related trades workers	6,67	5,8%	3,7%
Stationary plant and machine operators	6,69	3,7%	2,5%
Agricultural, forestry and fishery labourers	6,69	2,1%	0,8%

Position	AIE	Employed Persons RO 2023, % of Total	Employed Persons EU 2023, % of Total
Drivers and mobile plant operators	6,70	8,4%	4,2%
Market-oriented skilled agricultural workers	6,70	7,9%	2,6%
Legal, social, cultural and related associate professionals	6,74	0,5%	3,0%
Hospitality, retail and other services managers	6,74	0,4%	1,2%
Food processing, wood working, garment and other craft and related trades workers	6,75	3,9%	2,0%
Assemblers	6,76	1,9%	0,9%
Teaching professionals	6,78	3,5%	5,5%
Health associate professionals	6,80	1,4%	3,2%
Handicraft and printing workers	6,80	0,3%	0,5%
Chief executives, senior officials and legislators	6,84	1,0%	0,8%
Production and specialised services managers	6,84	0,8%	1,7%
Health professionals	6,85	2,9%	3,0%
Customer services clerks	6,87	0,8%	1,8%
Science and engineering associate professionals	6,89	1,3%	3,7%
Legal, social and cultural professionals	6,89	2,0%	1,8%
Other clerical support workers	6,92	0,5%	0,8%
Administrative and commercial managers	6,92	0,5%	1,4%
Business and administration associate professionals	6,97	3,2%	4,7%
Information and communications technicians	6,98	0,6%	2,5%
General and keyboard clerks	6,99	1,8%	4,3%
Science and engineering professionals	7,04	3,5%	3,5%
Numerical and material recording clerks	7,05	1,7%	3,1%
Business and administration professionals	7,07	4,7%	6,7%
Information and communications technology professionals	7,15	1,3%	1,1%

Source: Data from Eurostat and O*NET, processed by the author.
https://ec.europa.eu/eurostat/databrowser/view/lfsa_egai2d_custom_15660881/default/table?lang=en. Accession date: 17.03.2025

Our analysis of employment trends in the five most exposed groups shows that General and Keyboard clerks, as well as Science and Engineering Professionals, faced a larger decline than the average total employment over the past five years. Employment increased for Numerical and Material Recording Clerks and Business and Administration Professionals, while Information and Communications Technology Professionals showed no change, as shown in Figure 6.

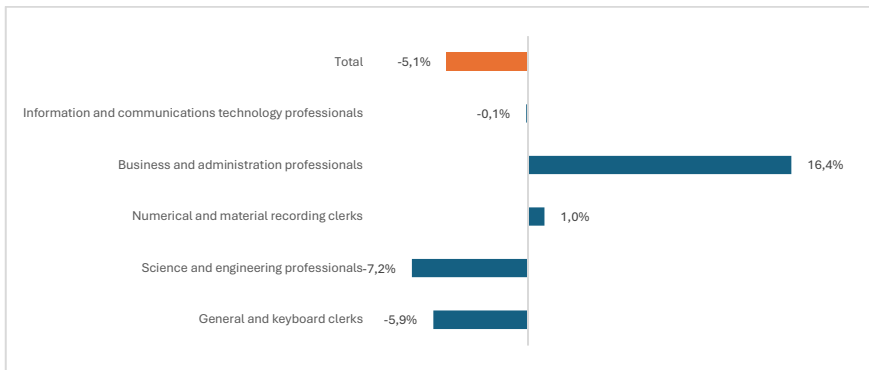


Figure 6: AI exposed groups employment evolution

Source: Data from Eurostat and O*NET, processed by the author.
https://ec.europa.eu/eurostat/databrowser/view/lfsa_egai2d_custom_15660881/default/table?lang=en. Accession date:17.03.2025

Performing the correlation analysis between AIE (Artificial Intelligence Exposure) and Employment Evolution using regression, we conclude that the correlation coefficient is approximately 0.037, which indicates a weak positive correlation.

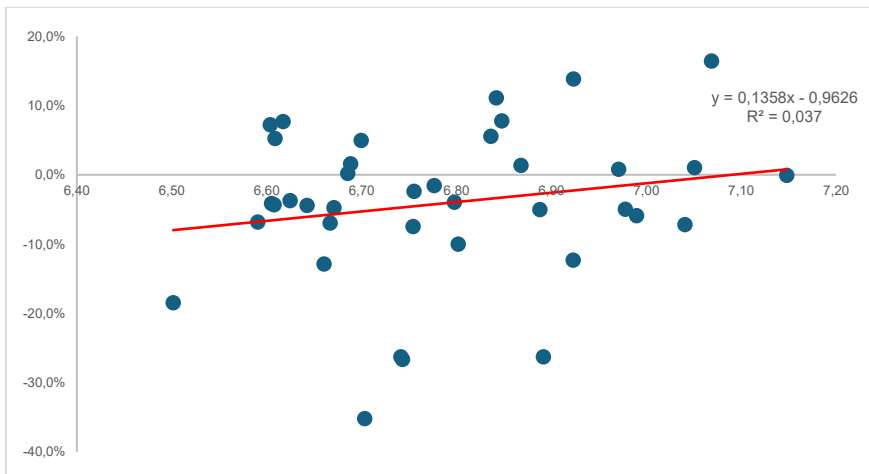


Figure 7: Correlation between AI exposure and employment evolution

Source: Data from Eurostat and O*NET, processed by the author.
https://ec.europa.eu/eurostat/databrowser/view/lfsa_ega12d_custom_15660881/default/table?lang=en. Accession date:17.03.2025

The scatter plot in Figure 7. visualizes the relationship between these two variables, suggesting that as AIE increases, there is also a slight tendency for employment to increase. However, because the p-value is greater than 0.05 (approximately 0.23), we cannot reject the null hypothesis that there is no correlation between these variables. This indicates that the observed correlation could be due to random chance rather than a true relationship in the underlying population.

4.4. Discussions

The methodology used is widely recognized and is based on O*Net's detailed database, which includes tasks and activities for each occupation. AI reasoning requires a data validation process because reasoning can be susceptible to bias. However, one limitation of these indicators is that they are influenced by the evolution of AI and may be inconsistent over time. The measured occupational exposure to AI was based on the current nature of occupations and did not account for potential changes in task composition. Additionally, the methodology does not determine whether AI substitutes or complements human labour. Predictions about the causal relationship between AI exposure scores and changes in the labour market rely on simplifications and the exclusion of other important factors, such as economic, organizational, legal, cultural, and societal aspects. Therefore, these calculated AI exposure scores focus on the potential for automation as of the present day. On the positive side, such studies contribute to the discussion on possible changes in the labour markets resulting from AI implementation and analyses the potential directions of change to facilitate appropriate policy responses.

5. Conclusions

In this study, we aimed to identify the potential impact of AI on the Romanian labour market. By calculating an AI exposure index at the occupational level, we extrapolated the results and applied them at the country level, taking into consideration the composition of the Romanian labour market. The first conclusion is that due to large employment numbers within occupations with low AI exposure scores, the average weighted AI exposure score for the Romanian market (6.75) is below the mean value of 6.81 and below the EU level of 6.79. While there were no occupations without exposure to AI, 73% of Romanian jobs fell within the range of middle exposure, and only 27% had high exposure to AI. Exposure itself does not lead to substitution or complementation of jobs; it only indicates the possibility of such outcomes. By analyzing the evolution of high exposure occupation groups, presuming that within these categories automation and AI solutions are being applied, we can conclude that a reduction in employment within General and Keyboard Clerks and Science and Engineering Professionals groups could be interpreted as a substitution effect. Meanwhile, in groups such as Recording Clerks, ITC Professionals, and Business and Administration Professionals, automation

solutions complemented their activities, increasing productivity and demand for those positions. Another conclusion is that AI and related automation will have an asymmetrical effect, as stated by Guarascio and Rejlic (2025), based on a country's labour market composition, innovation capabilities, and level of implementation. The analysis does not indicate the existence of a correlation between AI exposure and employment evolution in the Romanian labour market.

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INTEGRATING SUSTAINABILITY OBJECTIVES INTO CORPORATE SOCIAL RESPONSIBILITY PRACTICES

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Abstract: *The main purpose of this paper is to analyze how the Sustainable Development Goals (SDGs), elaborated by the United Nations (UN), are mainstreamed into the corporate social responsibility (CSR) strategies of modern companies. Specifically, the paper explores the conceptual and operational links between the two dimensions, highlighting their common points. It provides an overview of current practices and the social, economic and environmental impacts generated through coherent implementation. The research methodology is qualitative, based on literature review, case studies from specific Romanian companies and non-financial reporting documents. The research objectives include: O1: to investigate the conceptual and strategic synergies between the SDGs and CSR; O2: to analyze the involvement of three Romanian companies in order to achieve the SDGs; O3: to formulate strategic recommendations for the private sector and governmental actors. The conclusions emphasize the importance of strategic alignment, multi-sectoral collaboration and the use of standardized measurement tools for achieving the SDGs by 2030. The contribution of the paper is to strengthen the theoretical and practical framework for mainstreaming sustainability in corporate governance. It provides recommendations for the private sector, policy makers and civil society on mainstreaming sustainability into corporate strategy.*

Keywords: *sustainable development; corporate social responsibility; SDGs; sustainability; corporate governance.*

JEL Classification: *M14; L21; D64; O16.*

1. Introduction

The paper starts by explaining the basics of the concepts of CSR and the SDGs, outlining the essential directions that each of them follow. It also briefly describes the relevance of aligning CSR activities with the Sustainable Development Goals set by the 2030 Agenda in 2015. Due to the synergy between the two concepts, they can easily be integrated into the business strategies of both multinational firms and businesses. The proposed objectives of this paper are O1: to investigate the conceptual and strategic synergies between the SDGs and CSR. This first objective captures the underlying similarities between CSR activities and the Sustainable Development Goals. These similarities also explain how CSRs and SDGs can be linked. By acting locally and engaging in CSR activities, global goals set by the 2030 Agenda can be achieved. O2: analyzing the commitment of three Romanian companies towards achieving the

SDGs. In order to be able to observe how the SDGs can be achieved three companies with Romanian capital that are actively involved and have a well-defined sustainability strategy are analyzed. They are companies from different industries, aiming especially to highlight the versatility of the 17 Sustainable Development Goals and how companies from any industry can contribute to achieving them. O3: formulating policy recommendations for private sector and government actors. The third objective of the paper is to provide policy recommendations to help integrate global objectives into local CSR practices. The article closes with some conclusions on the analyzed topic.

1.1. Corporate Social Responsibility (CSR)

The concept of Corporate Social Responsibility has a lengthy and also dynamic evolution. It has been at the center of international academic and professional and corporate literature during a good period of time (Golob et al., 2013).

The formal literature focused on social responsibility, however, is largely the result of the 20th century, especially the recent 50 years. As such, it is debatable to establish how far we need to delve into the literature in order to begin discussing the conceptualization of CSR (Carroll, 1999). Considering the numerous research on the concept, there is a wide range of definitions related to it.

The World Business Council for Sustainable Development (2020) defines CSR as "the ongoing engagement of business to act ethically and continuously contribute to economic development while improving the quality of life of the workforce and their families, as well as the local community and society at large" (FuturAbility, 2022).

According to the new definition given by the European Commission (2011), CSR is: "corporate responsibility for the impact of companies on society". This responsibility involves the integration of social, environmental, ethical, human rights, human rights and consumer issues into business operations and core strategy in close cooperation with stakeholders.

Corporate social responsibility has never been more important. In recent years, the impact of corporations on the world has become undoubted (Chaffee, 2017). Most large, and increasingly small, companies have CSR departments, reports, teams or at least projects, and the topic is increasingly promoted as a core area of management alongside marketing, accounting and finance. In the context of such a steady rise in the importance of CSR, the literature is also booming (Crane et al., 2013).

Frederick, 2008, argues that CSR happens when a company, deliberately acts to improve the social well-being of those whose lives are impacted by the company's economic operations through the decisions and actions of its managers. As such, CSR blends and harmonizes economic activities with the social systems and institutions of a community, creating an organic link between business and society. The objective of this relationship is to strike a balance between the economic activities of companies and the aspirations and needs of society with respect to community well-being (Frederick, 2008, (pp. 3–38).

Porter and Kramer, 2006, argue that in order to make progress on CSR, we need to ground it in a comprehensive understanding of the relationship between business and society, while at the same time firmly anchoring it in companies' specific strategies and activities. Broadly saying that business and society need each other may sound like a

cliché, but it is also the truism that will get companies out of the mess created by their current thinking on corporate responsibility (Porter and Kramer, 2006).

In a similar way, Joyner and Payne, 2002, find that the way in which companies should engage in social life is an ethically symbiotic one. Business cannot exist without society and that society cannot move forward without business. Therefore, companies must recognize the existence of society and the increasing demand from society for more ethically responsible business behaviour (Joyner and Payne, 2002, p.298).

Arena et al. state that in today's competitive business environment, CSR has become an omnipresent phenomenon: it is a strategic issue for business managers, a policy issue for governments and policy makers, and a popular research topic among academics from various disciplines (Arena et al., 2017).

Thus, research shows that CSR is the voluntary involvement of companies with the aim of improving the quality of life in their communities. Either they choose to invest in projects that provide access and help improve health or education services, or they invest their resources in awareness-raising projects such as reducing food waste or reducing pollution, CSR is the power and force of companies to do good wherever they are.

1.2. Corporate Social Responsibility Dimensions

The CSR dimensions are meant to support both the development of CSR strategies and the integration of CSR into the overall business strategy. Over time, as the concept of CSR has evolved, several dimensions of corporate social responsibility have been proposed.

Carroll's Pyramid Model (1979) is one of the most recognized theoretical frameworks in the field of CSR. Developed by Carroll in 1979, this model describes four fundamental dimensions of Corporate Social Responsibility, arranged in the form of a pyramid (Figure 1).

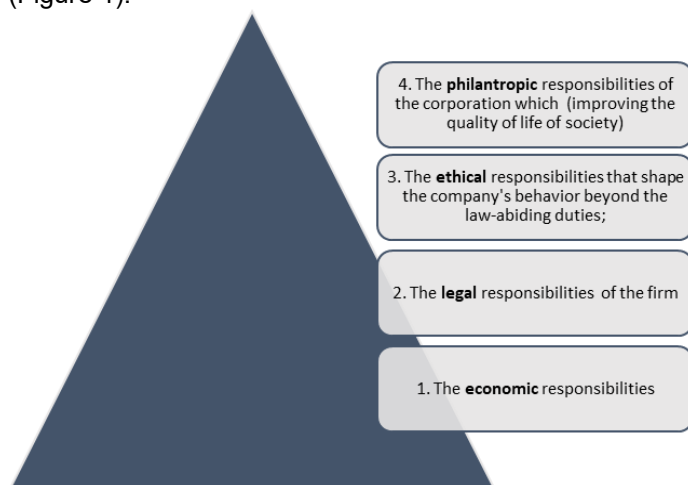


Figure 1: The Pyramid of Corporate Social Responsibility

Source: Adapted by author according to Carroll, 1979; Carroll, 1991

Each dimension represents an obligation that the company has towards society, and they are interlinked and built hierarchically, with companies' economic responsibilities at the bottom of the pyramid and philanthropic responsibilities at the top.

Economic responsibilities are the first and most important social responsibility of a business. Before anything else, business institutions are the basic economic unit in a society. Businesses have a responsibility to produce goods and services that they market for profit (Carroll, 1979).

Companies' legal responsibilities refer to the positive and negative obligations that companies have under the laws and regulations specific to the society in which they operate (Carroll, 2010).

Corporate ethical responsibilities refer to the integration of behaviors and practices that are considered right, fair and morally acceptable, even if they are not legally binding (Carroll, 1979).

Corporate philanthropic responsibilities are placed at the top of the pyramid and involve voluntary contributions made by companies to support social, educational, cultural and community causes. Philanthropy includes corporate actions that meet society's expectation that companies should be good corporate citizens (Carroll, 1991).

Carroll's pyramid model is a powerful framework for understanding how companies can integrate social responsibility into their business. This model helps organizations take a balanced and sustainable approach to all stakeholders, from ensuring economic profitability to actively engaging in philanthropic action.

The Triple Bottom Line (TBL) model developed by John Elkington in 1994 focuses on three fundamental dimensions of sustainability and CSR. In its simplest terms, the TBL agenda refers not only to the economic value added by companies, but also to the social and environmental value they add - or destroy (Elkington, 1997, p.3).

In 1997, Elkington argued that the future market success of companies will often be determined by the ability of an individual company (or the entire value chain) to simultaneously satisfy not only the traditional criterion of profitability, but also two emerging criteria: the first focused on environmental quality, the other on social equity. As a result, companies and their managers need to think in terms of the triple bottom line (Elkington 1997, p. 11). Figure 2 illustrates the relationship between these three dimensions of TBL.

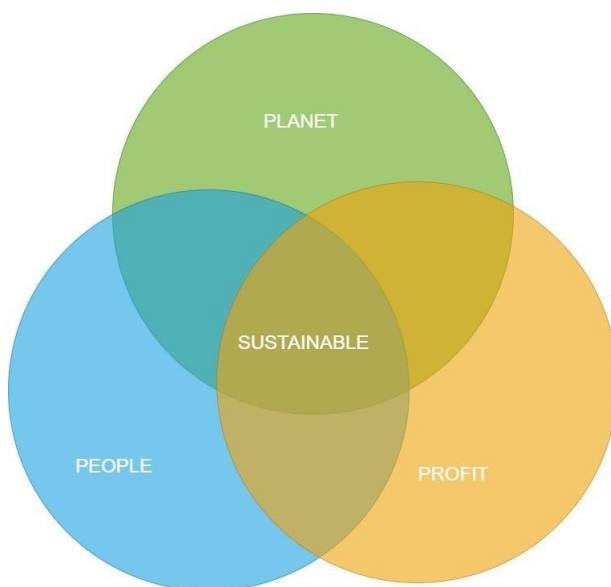


Figure 2. Triple Bottom Line

Source: Adapted by author according to Elkington, 1997

The versatility of the Triple Bottom Line model allows companies to apply social and environmental strategies in a sustainable manner. However, Slaper and Hall (2011) argue that there are challenges related to putting the TBL concept into practice. These challenges include the difficulty of measuring each of the three categories, of identifying applicable data, and of calculating the contribution of a project or policy activity on sustainability. Looking beyond these challenges, the TBL framework enables organizations to assess the implications of their own decisions through a truly long-term oriented view (Slaper and Hall, 2011).

1.2. Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people can enjoy peace and prosperity (UNDP).

Sustainable Development Goals are meant to universally promote respect for human rights and ensure gender equality, along with the empowerment of all women and girls. A defining element of the new Agenda is the integrated and indivisible nature of the goals, which reflect the relationship between the three key dimensions of sustainable development: economic, social and environmental. Over the next 15 years, these goals and targets are intended to generate concrete and sustained action in areas considered of critical importance for human well-being and for protecting the planet (Assembly, 2015).

Romania pays considerable importance to the UN, an organization with a universal vocation, which is the largest multilateral framework for addressing major global issues, including long-term development issues.

Romania is engaged to implement the SDGs at national level and has revised the National Strategy for Sustainable Development to this end. As a member of the European Union, Romania contributes to the achievement of the SDGs not only from a national perspective, but also at international level, by supporting other countries through official development assistance (MFA, 2023).

Table 1: Sustainable Development Goals (SDGs)

Goal 1 No Poverty	Goal 2 Zero Hunger	Goal 3 Good Health and Well-being	Goal 4 Quality Education	Goal 5 Gender Equality
Goal 6 Clean Water and Sanitation	Goal 7 Affordable and Clean Energy	Goal 8 Decent Work and Economic Growth	Goal 9 Industry, Innovation and Infrastructure	Goal 10 Reduced Inequalities
Goal 11 Sustainable Cities and Communities	Goal 12 Responsible Consumption and Production	Goal 13 Climate Action	Goal 14 Life Below Water	Goal 15 Life on Land
Goal 16 Peace, Justice and Strong Institutions		Goal 17 Partnerships for the Goals		

Source: Edited by the author according to Assembly, 2015.

The table describes the 17 Sustainable Development Goals that were proposed in 2015 to be achieved by 2030. Unfortunately, the 2023 Human Development Report notes that "In 2023, we are halfway to 2030, but progress has stalled on a third of the goals, and half of them are not being sufficiently acted on. Although the world is increasingly connected, this does not necessarily mean things are getting better. Poverty and hunger have increased in recent years and this has taken us further and further away from the goals set by the 2030 Agenda" (Human Development Report, 2023/2024, p.19).

It is something that should make us mobilize even more. From small firms to large companies, all are important actors that can contribute to solving the 17 SDGs and thus to a better world.

2. The synergies between SDGs and CSR

Along with the Paris Agreement on Climate Change (December 12, 2015), there have been changes in the need for countries to report on specific actions and progress made to mitigate climate change. 196 countries, which have signed the Agreement, have an obligation to transparently report on measures taken and the reduction of environmental impacts. For companies, the current context (2025) requires compliance with the Corporate Sustainability Reporting Directive (CSRD), which is a piece of legislation adopted by the EU to improve quality, transparency and comparability of companies' sustainability reporting. It replaces and extends the Non-Financial Reporting Directive and brings more stringent and enforceable requirements for companies (Stratos, 2025).

An illustrative argument pointing to the importance of CSR practices is their alignment to achieve the Sustainable Development Goals (SDGs). The 2030 Agenda for Sustainable Development comprises a set of 17 SDGs, which promote a balance between the three dimensions of sustainable development: economic, social and environmental (MFA, 2023).

Looking at the CSR Pyramid model (Carroll, 1979) and the Triple Bottom Line (Elkington, 1994), we can see that they have common points with the categories of goals set out in Agenda 2030. More specifically, the CSR Pyramid model is based on companies' compliance with the four fundamental dimensions: economic, legal, ethical and philanthropic (Carroll, 1979). According to the TBL model, businesses must take responsibility for measuring their social and environmental impact, not just their financial performance, and not focus solely on profit generation. This model focuses on three dimensions- economic, social and environmental (Elkington, 1994). By applying the TBL model, companies can integrate sustainable practices in each of the three dimensions to increase their positive impact on society and the environment while at the same time performing well financially. Therefore, an alignment of business and government, and global collaboration to achieve these goals, can generate considerable impact on social and environmental needs without undermining the importance of making a profit.

Figure 3 shows that both Agenda 2030 and CSR have similarities given by the economic and legal dimensions. We can also observe that the social, environmental, ethical and philanthropic dimensions are not exclusively specific to Agenda 2030 or CSR, but are rather connected.

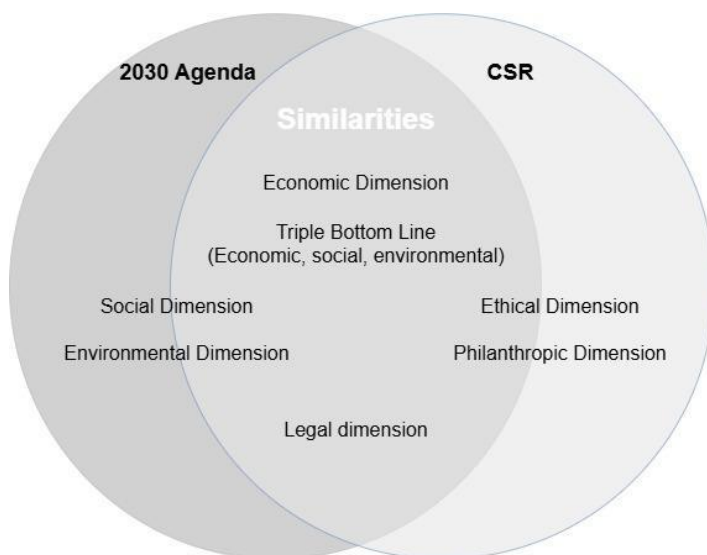


Figura 3. The correlation between CSR dimensions and the 2030 Agenda

Source: Adapted by author

In order to contribute to the achievement of the 17 SDGs, companies are able to choose, according to their industry and business strategy, to implement CSR actions, guided by the 2030 Agenda. CSR is the tool for companies to address real and urgent needs of the society they are part of. The 17 SDGs are meant for exactly the same purpose. So, it could be a good practice for companies to identify which of the SDGs can be integrated into their business strategy, then select from the 169 associated targets to be achieved by 2030 which ones are within their scope and act accordingly. The similarity between the 2030 Agenda and companies' engagement in CSR activities arises from the economic, social and environmental aspects that are representative of them.

3. Case studies: Integrating the SDGs into the CSR practices of Romanian companies

Analyzing how companies can integrate the Sustainable Development Goals into their corporate social responsibility strategies is essential for understanding the private sector's contribution to the 2030 Agenda.

Romania strongly advocates that the implementation of the 2030 Agenda must be realized at the local level, through public institutions that can directly respond to citizens' needs and expectations. The elaboration of development strategies, both at local and national level, must start from the identification and integration of these community needs, interests and concerns (Celac and Vădineanu, 2018).

Therefore, in this paper we selected three Romanian companies from different industries, which provide relevant examples of aligning CSR practices with the UN goals. Depending on the area of interest and the need identified in the communities in

which they operate, each of the companies can contribute to solving the 17 SDGs and, implicitly, to a better world. Such alignment with the Global Goals is necessary, precisely because small steps and active involvement will more effectively achieve the goals set by the 2030 Agenda.

3.1. Altex Romania

In spite of the fact that Altex Romania has not published a sustainability report for the year 2024, the company is involved in a number of CSR programs and projects, respectively, they are aligned to solve the SDGs. In 2020, Altex set up the Altex Foundation, a non-governmental organization, in order to support the community in areas such as education, health and environmental protection (Altex Foundation. 'Misiune').

Through its three lines of action, Altex Foundation manages to quickly involve itself with resources to respond to the urgent and immediate needs of the Romanian community in exceptional situations such as pandemics, epidemics or natural disasters. Linking this engagement with the SDGs, we can observe that it is in line with SDG 1 (Poverty Free); SDG 3 (Health and Well-being); SDG 11 (Sustainable Cities and Communities) and SDG 17 (Partnerships for Achieving the Goals). Through its Emergency program, between 2020-2021, Altex Romania Foundation has donated over 4380000 lei to hospitals in Bucharest and throughout Romania, thus helping to save thousands of lives.

In the Education sector, Altex Foundation contributes to the upgrading of the education system by improving teaching techniques and methods, developing teachers' skills and supporting the relationship between teachers and students. <https://fundatiaaltex.ro/educatie/>. This direction of involvement responds to SDG 4 on quality education.

Regarding environmental protection, Altex Foundation sustains projects focused on the development of a strong infrastructure, useful for increasing the rate of collection of electrical and electronic waste, based on and promoting sustainable and fair principles (Altex Foundation. 'Mediu'). Since 2013, Altex Romania has been carrying out projects to reduce the waste electrical and electronic equipment (WEEE) disposal. And since 2017, Altex has received annually, the award for the most WEEE collected.

There is an obvious correlation with the SDGs, the company contributes to solving SDG 12 (Responsible Consumption and Production) in particular through the Buy Back program, Altex encourages circular economy, reuse and recovery of resources. It also achieves SDG 11 (Sustainable Cities and Communities); SDG 13 - Climate Action, precisely because the recycling of WEEE contributes to reducing greenhouse gas emissions associated with the extraction and processing of natural resources. SDG 9 (Industry, Innovation and Infrastructure) and SDG 3 (Health and Well-being).

As a result, through the CSR activities that the company implements, it contributes directly to the achievement of the 2030 Agenda.

3.2 Autonom Romania

Autonom Romania is a 100% Romanian-owned company, established in 2006 in Piatra Neamț and is a top 3 player, by turnover, in its main business sectors: operational leasing and car rental. Since its establishment, the Autonom group has grown annually by double digits, reaching a turnover of more than 80 million euros in 2021.

Autonom is engaged in its communities through the Autonom Foundation. Since 2012, it has been supporting and getting involved in projects to promote educational development. By 2022, the Autonom Foundation has realized 840 educational projects. In 2021, the company published its Sustainability Strategy announcing its commitment to sustainable development.

"Since Autonom's beginnings, our vision from the very beginning was to be an authentic business model and have a positive impact on society and the environment. Community involvement through educational support is an integral part of our organizational culture. It is everyone's responsibility, company or individual, to contribute to maintaining and creating a better, a safer and cleaner world." (Marius Stefan, CEO Autonom)

Autonom's strategic sustainability directions are Environment, People and Community, Sustainable Business and Governance.

Through the direction addressing the environment, Autonom responds to the following SDGs: ODD 7, ODD9, ODD 11, ODD 13, ODD 15. Their goal is to reduce their carbon footprint by 25% by 2025 and 51% by 2030.

Autonom is achieving these targets by contributing to a circular economy by reducing paper use in administrative and operational activities by 10% per year. Also, a goal they have set involves recycling used oil and tires 50% by 2030.

The second strategic sustainability direction Autonom is pursuing is People and Community. The company starts from the premise that they need to evolve every day, so they have a strong focus on the employees' personal development.

They also target community involvement through the development of high-impact educational projects and the investment of a minimum of 2% of net profits for their implementation. Thus, they respond to SDGs 4 (quality education) and 8 (decent work and economic growth).

The third strategic direction that the company follows in terms of sustainability about Sustainable Business and Governance. It focuses on business decisions guided by transparency, simplicity, autonomy and sustainability. It also enjoys a high customer satisfaction rate and is among the top 5 companies in the industry in terms of visibility and awareness. It therefore responds to SDG 17 (Partnerships to Achieve the Goals). Autonom is certainly one of the companies that act responsibly and with care for people and planet.

3.3 Transilvania Bank (BT)

Banca Transilvania established itself as a reliable and sustainable development player in the communities in which it operates, standing out for its constant commitment to social responsibility. This is reflected in continuous investments in education, support for local entrepreneurship and strategic collaborations with non-governmental organizations. (Banca Transilvania, 2024).

In the Allocation and Impact Report, published in September, 2024, representatives of Banca Transilvania state that "As we fast approach 2030, it is clear that the European

financial landscape will be profoundly transformed by the principles of the sustainable finance concept, which will gradually become an intrinsic part of its structure. Therefore, we recognize that our role as the largest bank and financial group in Romania is fundamental in shaping the future of sustainable finance at the national level and in contributing to Europe's sustainability goals." (Allocation and Impact Report, 2024, p. 10).

For Transilvania Bank, social responsibility means a transparent commitment to the community as a form of gratitude and active support. Involvement in social projects is realized both at the national level, through initiatives with wide-reaching impact, and at the local level, through the territorial network, which allows a direct and constant connection to the specific needs of the communities (Banca Transilvania (Banca Transilvania, 2024).

Table 2: Financial results of Banca Transilvania's community involvement in 2024.

2024			
Investment s	Projects	Partner organizations	Donations (in BT Pay)
80	315	300	10, 062 (over 1 million lei)

Source: adapted by the author according to
Banca Transilvania, 2024, <https://comunitate.bancatransilvania.ro/>

"All our efforts demonstrate once again that, step by step, we are moving towards a sustainable economy. Responsible growth is therefore an integral part of our commitment, recognizing that non-financial performance is as important as financial performance." (Ömer Tetik CEO, Banca Transilvania).

In order to analyze how Banca Transilvania engages in addressing the SDGs, we have included in Table 3 the correlation between its CSR activities and the SDGs achieved. Also, the total amount invested for each category.

Table 3: The correlation between CSR activities and the SDGs achieved by Transilvania Bank in 2024

CSR activities category	CSR activities	Amount invested (million EUR)	SDGs achieved
Green buildings	Residential	143,87	SDG 7 - Clean and affordable energy
	Commercial	149,26	SDG 11 - Sustainable cities

Renewable energy	Solar energy	81,89	and communities
Clean transport	Vehicles with zero emissions	0,19	SDG 13 - Climate action
SME funding	Under-developed regions	2165,64	SDG 1 - No poverty SDG 5 - Gender equality SDG 8- Decent work and growth SDG 10- Reduced inequalities
	Women owned	542,31	
	Start-ups	192,34	
	Self-employed farmers	69,81	
Access to medical care	Health care facilities	113,89	SDG 3 - Health and well-being
	Primary care units	8,63	
	Palliative care centers	5,89	
	Dialysis and oncology centres	17,73	
Access to education	Education facilities	0,27	SDG 4 - Quality education SDG 10 - Reduced inequalities
Total (all categories)		3509,98	1, 3, 4, 5, 7, 8, 10, 11, 13

Source: Adapted by author based on data from the Allocation and Impact Report, 2024, page 17-19

As can be seen, a large part of the bank's investments are directed to the SME Financing category with a value of 2970.1 million euro, followed by the Green Buildings, Renewable Energy and Clean Transportation category with an investment value of 375.21 million euro, the third category is Access to Health Education with 146.14 million euro and the fourth category is Access to Education projects with a value of 0.27 million euro. Through this involvement, Banca Transilvania joins the resolution of 9 of the 17 SDGs, thus contributing to a better world.

4. Critical Analysis and Synthesis

The Sustainable Development Goals set out in the 2030 Agenda aim to address urgent and real problems facing communities worldwide. However, due to the current political economic situation (2025), achieving them by 2030 is hard to imagine.

The Sustainable Development Report 2023 states that the Sustainable Development Goals face major obstacles. Despite considerable efforts in some regions, most national governments, regardless of continent, have failed to fully integrate the SDGs into national public policies and investment strategies. At the same time, the polarization of society, rising populism and increasing geopolitical tensions undermine the international cooperation needed to achieve these goals. Moreover, the current international financial architecture is failing to channel global economies towards the investments needed for the SDGs, neither at the pace nor at the scale required by the urgency of the goals (Sachs et al., 2023, p. 4).

Certainly, since 2015 to date, thanks to the 2030 Agenda, many aspects targeting the 17 global goals have improved considerably and more opportunities have emerged for the signatory countries. For example, investments in education, health, infrastructure and environmental protection, as stipulated in the SDGs, lead to the creation of new jobs and implicitly contribute to improving the quality of life of the inhabitants.

Similarly the practice of CSR activities is often lacking strategic alignment with business strategy. As firms and companies start to act strategically on CSR, changes at regional, and subsequently global, level will not cease to emerge. This article captures the importance of close collaboration between government and business actors, as it is through collaboration and strategic partnerships that results can be achieved.

As a recommendation, governments should support and closely follow up CSR activities and then evaluate the impact. CSR activities are no longer a voluntary choice for companies, they are their responsibility to protect and care for the communities, economies and environment in which they operate. And companies must take their social responsibility seriously and act in line with their business strategy and the needs they identify in the communities where they operate.

5. Conclusions and strategic recommendations

This paper analyzes, firstly, the specifics of CSR activities and its underlying dimensions and, secondly, describes the concept of Sustainable Development Goals and how they aim to solve global problems.

Since they have several synergies and common principles that they follow, the article captures how the SDGs can be integrated into the CSR strategy, which would facilitate the path towards the fulfillment of the 2030 Agenda.

The study also analyzes three Romanian-owned companies that are actively engaged in CSR activities and are responding to the SDGs at a global level. Aligning the private sector with government policies and international collaboration can amplify the impact of CSR activities, effectively responding to global challenges.

Due to the unstable political and economic situation in recent years (e.g. the COVID 19 pandemic) we are facing a slowdown in achieving the 17 SDGs. It is therefore of paramount importance to have strong collaboration between national governments and business in order to continue moving towards a world without hunger, poverty, access

to healthcare and education, investment in infrastructure, climate action, renewable energy.

The objectives of the paper were achieved:

O1: Investigating conceptual and strategic synergies between the SDGs and CSR: The CSR Pyramid (Carroll, 1979) and Triple Bottom Line (Elkington, 1994) models show similarities with the 2030 Agenda goals, promoting corporate responsibility beyond profit. While the CSR model emphasizes economic, legal, ethical and philanthropic dimensions, TBL proposes an integrated assessment of economic, social and environmental performance. By applying these principles, companies can contribute to sustainability and specific points of the 2030 Agenda while maintaining financial efficiency.

O2: analyzing the commitment to the SDGs of three Romanian companies: The analyzed companies invest part of their profits in education, access to health services, care for the environment, access to quality education and decent working conditions, manifested by caring for their employees. This analysis highlights that regardless of the companies' area of activity, they can identify key SDGs to address through corporate social responsibility practices.

O3: Provide strategic recommendations for the private sector and government actors: Systemic action between the public and private sectors can generate effective change needed to move towards authentic sustainable development.

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OBJECTIVE VS. SUBJECTIVE MEASURES OF OCCUPATIONAL AI EXPOSURE: A COMPARATIVE ANALYTICAL APPROACH

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Abstract: *Perception of artificial intelligence (AI) represents an important indicator of how societies interpret and adapt to rapid technological change. While AI increasingly reshapes occupational structures, the divergence between objective measures of exposure and subjective perceptions remains insufficiently understood. Objective exposure can be estimated using occupational task profiles and quantitative indices, whereas subjective perception reflects deeper social, cultural and psychological mechanisms that influence how individuals internalize technological transformations. This study examines how young people evaluate AI exposure in relation to the occupations they aspire to, contrasting their assessments with established quantitative exposure indicators. Using survey data collected from 135 respondents aged 15–25, we compare perceived exposure with model-generated values to identify systematic gaps in understanding. Our results show that the quantitative model produces relatively consistent exposure levels across occupations, with most jobs falling within a moderate to high exposure range and displaying limited variation. By contrast, subjective perceptions are considerably more heterogeneous. Respondents generally assign lower exposure scores than the model predicts, indicating a tendency to underestimate the extent to which AI may affect future job content. Although the median perception score (6) is close to the model's value, the mean is significantly lower ($5.5 < 6.86$), reflecting a distribution skewed toward lower perceived exposure. Gendered patterns also emerge: women report a higher median perception score, potentially reflecting greater concern regarding AI-driven disruption, while men express more optimistic assessments. These findings suggest that perceived vulnerability to AI is shaped not only by occupational characteristics but also by broader cultural and social factors. Overall, the study highlights a persistent misalignment between quantitative exposure indicators and human perception, raising important implications for career guidance, skills policy and public understanding of technological change.*

Keywords: artificial-intelligence; perception; labour-market; employment; exposure.

JEL Classification: J24; O33; J21

1. Introduction

Artificial Intelligence (AI) is increasingly described as an emerging general-purpose technology with the potential to reshape labor-market dynamics. This prospect has intensified scholarly and public debates around the extent to which different occupations are exposed to AI-driven change. Foundational approaches such as Routine-Biased

Technological Change (Autor *et al.*, 2003) and Skill-Biased Technological Change (Acemoglu and Autor, 2011) established the analytical basis for assessing task-level vulnerability to automation. Building on these frameworks, a wide range of exposure indicators has been developed, including the Mean Automation Score (Gmyrek *et al.*, 2023), AI Occupational Exposure, AI Industry Exposure, the AI Geographic Exposure Indicator (Felten *et al.*, 2021), the Generative Artificial Intelligence Index (GenAI), Language Modelling-based exposure measures (Nurski and Ruer, 2024), or the GPT Exposure Rating (Eloundou *et al.*, 2023). These metrics link AI capabilities to occupational skill requirements and help map potential labor-market impacts, although no widely accepted standard has yet emerged. They also do not predict future developments and remain agnostic regarding whether AI acts as a substitute for, or a complement to, human work. Empirical patterns nevertheless show employment increases in occupations labelled as highly exposed to AI (Guarascio *et al.*, 2025). Beyond such objective assessments, a growing research strand highlights the social dimension of technological transitions, focusing on how individuals perceive AI exposure both within their occupations and across the broader labor market (Voigt, 2025). (Liu, 2021) distinguishes several interpretive lenses: a cultural perspective that examines the social, political and symbolic implications of AI in the digital transformation; a scientific perspective centered on AI as a research domain; and a technical perspective that views AI as a meta-technology reshaping production systems and occupational configurations. Understanding these perceptions is crucial for designing and adapting implementation strategies and for promoting acceptance of technological change. Studies examining perceptions in local contexts also reveal how regional economic structures and urban labor markets mediate such views. This paper brings together objective AI-exposure measures with survey evidence on individuals perceived exposure to AI.

2. Literature review

The relationship between technological progress and work has historically followed a cyclical pattern, both in terms of expectations and public sentiment. In his influential essay *The Distribution of Work and Income*, Leontief (1982) speculated that continued technological development might eventually reduce the need for human labor as dramatically as industrialization once displaced horses. His concern centered on the possibility of deep structural underemployment brought about by automation. Langlois (2003) later expanded this line of thinking by examining the long-run co-evolution of humans and machines, emphasizing that the distribution of tasks between them is repeatedly renegotiated as new technologies emerge. A major conceptual shift in studying how technology affects labor came with the task-based framework introduced by Autor, Levy, and Murnane (Autor *et al.*, 2003). Their model differentiated tasks into routine and non-routine, as well as cognitive and manual, and proposed that machines tend to replace routine work while enhancing non-routine cognitive activities. This insight became the cornerstone of the Routine-Biased Technological Change (RBTC) hypothesis, which views production as a set of tasks that can be assigned either to labor or capital. This framework helped establish the narrative of technology as an external shock to which workers must continually adapt, while questions of human agency and

social interpretation received comparatively little attention. Acemoglu and Autor (2011) reframed the discussion through the Skill-Biased Technological Change (SBTC) perspective, arguing that advanced technologies raise the demand for skilled labor while diminishing opportunities for workers engaged in routine or lower-skill activities. DeCanio (2016) introduced the elasticity of substitution between labor and capital into production models, making it possible to quantify the complementarity–substitution dynamic. The emergence of extensive occupational datasets such as O*NET then enabled researchers to operationalize these theoretical categories by mapping task content across occupations. Frey and Osborne (2017) intensified public debate by estimating that nearly half of U.S. jobs faced a high probability of computerization. Their results prompted critiques such as that of Arntz et al. (2017), who argued that occupation-level estimates overstate risk by ignoring task variation within occupations. The development of machine-learning tools led to more refined approaches. Brynjolfsson et al. (Brynjolfsson *et al.*, 2018) introduced the Suitability for Machine Learning (SML) index to capture which tasks are more exposed to AI systems. The rapid diffusion of Large Language Models (LLMs) and generative AI further reshaped both measurement practices and theoretical debates. Eloundou et al. (2023) showed that most U.S. occupations include at least some tasks that could be potentially affected by LLMs. Other scholars, including Fernández-Macías and Bisello (2022) and Gmyrek et al. (2023), advanced composite task-level indicators, that contributed to a growing methodological convergence on how exposure is measured. While none of these indicators has become a universally accepted benchmark, together they provide increasingly comparable ways to examine how is perceived technological vulnerability. Empirical evidence, however, challenges the assumption that high exposure necessarily leads to employment decline. Guarascio and Reljić (2025) suggest a gap between perceived threat and actual labor-market outcomes. This divergence between measurable exposure and subjective interpretation has emerged as a central issue in contemporary research. At a broader economic scale, Brynjolfsson and Unger (2023) contrast pessimistic and optimistic scenarios with respect to productivity gains, inequality, and industrial concentration linked to AI adoption. Understanding how individuals perceive AI exposure today requires integrating the task-based analytical tradition with insights from socio-cognitive research on technological anxiety, trust, and adaptation. An increasing number of studies focus explicitly on perceptions, how AI is anticipated, interpreted, and evaluated, rather than estimating exposure solely through task taxonomies. Large-scale surveys illustrate these dynamics: in the United States, PEW Research Center (2025) reports that more workers feel worried (52%) than optimistic (36%) about AI's future role at work, with younger and more educated groups expressing relatively more confidence. Similarly, the European Commission's Special Eurobarometer finds strong overall support for AI use, yet accompanied by persistent concerns that AI may eliminate more jobs than it creates ('Special Eurobarometer SP554 : Artificial Intelligence and the future of work', 2025).

3. Methodology

The present research aims to measure young people's perceived exposure to Artificial Intelligence (AI) in relation to the occupations they aspire to, in order to identify prevailing perception patterns — *pessimistic*, *realistic*, or *optimistic* — regarding AI's

future impact on employment. A total of 135 respondents, aged between 15 and 25 years, participated in the survey conducted between September and October 2025. Data were collected in person during dedicated meetings and youth-oriented workshops, rather than through open online distribution. This approach ensured a more focused and contextually relevant sample, engaging participants already involved in discussions on future skills, technology, and the labour market. The questionnaire was designed and administered using the GLIDE platform and aimed to capture both subjective perceptions and objective exposure indicators. It included the following variables: *participant name* (for internal tracking only, anonymized in analysis); *gender*; *educational level*; *desired job*, selected from a predefined list of occupations, searchable through a bar interface; *job group/category* automatically assigned based on the selected occupation; *perceived exposure score*, rated by participants on a 1–10 scale, where 1 indicated no exposure and 10 indicated very high exposure and *Calculated AI Exposure*. Data analysis relied on descriptive and inferential statistics to identify general patterns and central tendencies in participants perceived exposure scores. Each desired occupation was then associated with an existing AI exposure index, allowing a comparison between participants' subjective assessments and the objective exposure levels attributed to those occupations. This comparison highlights potential perception gaps and offers insights into how young people understand the relationship between AI and the future of work. To enable robust inferential testing and ensure adequate sample size (minimum 3 observations), the detailed occupational codes were aggregated into four ISCO-08 major groups: Managers (ISCO 1), Professionals (ISCO 2), Technicians & Associate Professionals (ISCO 3) and Service, Crafts & Manual Occupations (ISCO 4-9). The test evaluates H_0 : the distribution of perception scores is identical across all major occupational groups. Tests were running within each occupational major groups by gender and educational level. Results were generated only where subgroup sizes permitted the non-parametric comparison. Statistical analysis was conducted in Python using pandas, matplotlib, scipy, seaborn and statsmodels package.

4. Results and discussions

The data collected from 135 participants offers a nuanced perspective on how young people perceive the impact of artificial intelligence (AI) on their professional future.

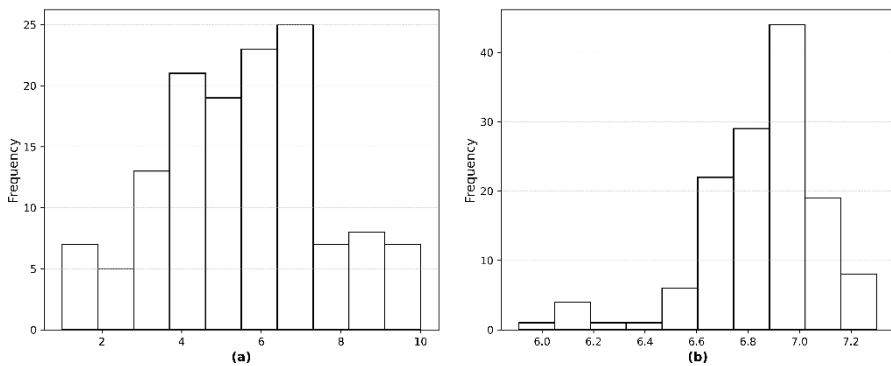


Figure 1: Distribution of AI Exposure: **(a)** perceived and **(b)** calculated
Source: Survey data processed by the authors in Python

The distribution of responses shown in Figure 1a is concentrated around values $Q1=4$ and $Q3=7$, with a $\min=1$, $\max=10$, and exhibits positive skewness, meaning more respondents selected higher values. The median is 6, which is greater than the mean, confirming a right-skewed distribution. Overall, perception is moderate.

3.1.2. Aggregate level results Although the objective level of AI exposure across different professions falls within a relatively narrow range (5.9–7.3), participants' responses span the full scale from 1 to 10. This wide variation highlights not only the diversity of opinions, but also the intensity of the social imagination surrounding technology. Comparing overall perceived, survey-based subjective AI exposure (Answers) with the objective, calculated AI exposure (AIE), the mean of perceived values are much lower than the calculated: 5.51 vs 6.86. Distribution for each variable are presented in Figure 2:

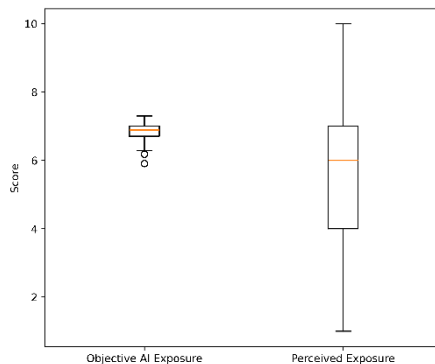


Figure 2: Distribution of perceived and calculated AI exposure
Source: Survey data processed by the authors in Python

Both mean and median values are lower in case of answers than the model predicted values. Spreads are narrow for calculated values (6.7 – 7.3) compared to much wider for answers (4 – 7). On calculated values outliers are few and close to whiskers values, while in case of perception outliers are present at the low and high end (1 and 10). The

discrepancy between objective estimates and subjective perceptions suggests that AI is not interpreted solely in technical terms, but through symbolic, emotional, and cultural lenses. For some young people, AI represents a promise of progress, for others, a source of uncertainty or even threat. These perceptions reflect not only levels of information, but also how individuals project their professional identity and the values they associate with work. Occupational group analysis (see Figure 3) reveals consistent differences in perception. Participants aspiring to management roles (24%) tend to underestimate AI's impact, relying on interpersonal and decision-making skills. In contrast, those in technical fields such as IT, engineering, and the natural sciences (13,3%, where median scores exceed 7) express heightened awareness of automation risks. Professions involving manual labor, protective services, or creative roles (e.g., dancers, actors, food processing workers) report scores below 5, suggesting a lower perceived vulnerability. These patterns reflect how the nature of professional activity: algorithmic vs. human-centered, shapes expectations about AI.

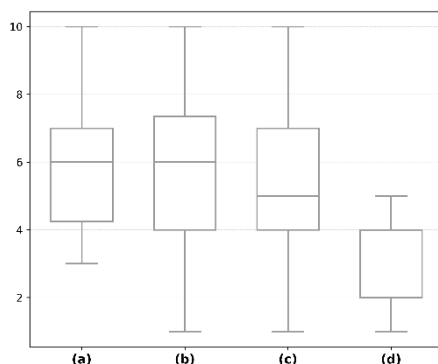


Figure 3: Distribution of perceived AI exposure across major occupational groups: (a) = Managers (ISCO 1), (b) = Professionals (ISCO 2), (c) = Services & Manual Workers (ISCO 4-9), (d) = Technicians (ISCO 3).

Source: Survey data processed by the authors in Python

Creative fields such as arts and design show marked polarization: some participants view AI as a tool for expression, while others see it as a direct rival to creativity. Meanwhile, young people envisioning careers in health (9.6%) and education (8.1%) tend to see AI as a complementary tool, indicating confidence in the human dimension of their work. From the selected 19 groups only 3 was rate higher than model's values: data clerks, drivers and ICT specialists. As you can see in Figure 3, the main pattern is a strong variation of spread between occupational groups, suggesting differences in perception consistency. The most heterogenous major group is Professionals (ISCO 2), while in technical related field (Technicians ISCO 3) exhibit the narrowest quartile band, suggesting consistent perceptions. In most of these occupations respondents underestimates exposure. Large variations can be observed within sales workers and judiciary, social and cultural professions. At gender-based level (see Figure 4), female participants reported a median score of 6.00, while male participants had a median of 5.00, both below the overall sample average (6.86).

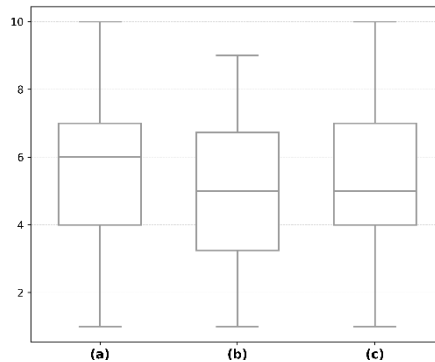


Figure 4: Distribution of perceived AI exposure by genre **(a)** Female, **(b)** Male, **(c)** Anonymous

Source: Survey data processed by the authors in Python

Women's' interquartile range are narrower than male respondents', suggesting a more homogenous view. Male respondents have a lower median and upper quartile, suggesting a more confident or optimistic perception, while women's narrower spread suggest a more homogenous views. These differences may be linked to distinct vocational orientations, varying levels of technological familiarity, and cultural or educational influences. Across these segments, three distinct patterns of technological perception emerge: realist, a balanced view, closely aligned with objective estimates; pessimist, an overestimation of risks, common in technical and creative domains; optimist: an underestimation of AI's disruptive potential, typical of professions centered on human interaction. The Spearman correlation analysis reveals a weak positive correlation. The result is statistically significant ($\rho = 0.241$, $p = 0.0048$) indicating that perceptions are partial aligned with objective exposure scores. The magnitude of the coefficient suggests that subjective assessments only partially reflect the corresponding objective measurements. These findings imply that individuals possess some intuitive understanding of occupational vulnerability to AI. Regression model has a value of $R^2 = 0.075$, which indicate that the model explains 7.5% of the variance. Values presented in Table 1. Show that the key predictor (objective AI Exposure) has a positive and statistically significant relation with perceived exposure ($\beta = 2.205$, $p = 0.008$). In contrast, variables genres and educational level do not significantly predict perceived exposure, with coefficients close to zero, suggesting that perceived AI Exposure is not shaped strongly by these control variables.

Table 1. Results of linear regression analysis for predictors of AI Exposure perceptions

	Coefficient	Std_Error	t_Statistic	p_Value
Intercept	-9,216	5,570	-1,655	0,100
C(Gen)[T.F]	0,062	0,479	0,130	0,897
C(Gen)[T.M]	-0,694	0,512	-1,356	0,177
C(Educational_Level)[T.University]	-0,438	0,392	-1,117	0,266
Q('AI Exposure')	2,205	0,811	2,718	0,008

Source: Survey data processed by the authors in Python

Overall, the model indicates that objective exposure is the only variable that significantly explains perceived AI exposure, although the predicting power of the model remains modest. Residual diagnostics presented in Figure 5 indicate that model assumptions are acceptable, with residuals normally distributed and show no strong heteroscedasticity pattern.

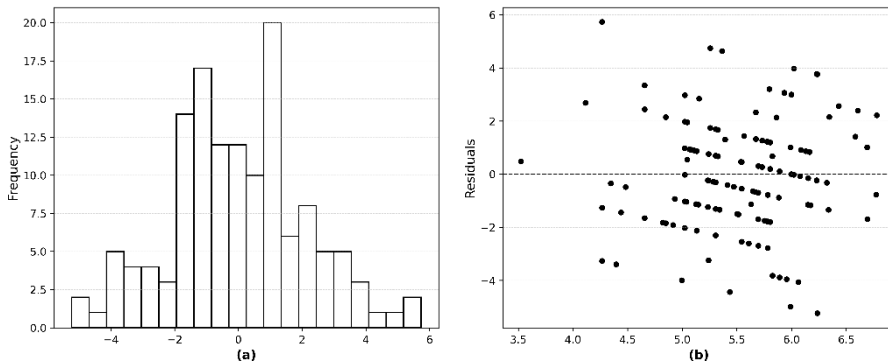


Figure 5. Residual diagnostic: residuals histogram (a) and fitted vs residuals (b)

Source: Survey data processed by the authors in Python

We first examined whether perceived AI Exposure differ across the four major ISCO-08 groups. Overall, the Kruskal-Wallis test showed a statistically significant difference in perceived AI Exposure between the four major occupational groups ($H = 10$, $p = 0.013$). This supports the assumption that students differentiate occupational risks depending of the nature of the job. Kruskal-Wallis tests were performed separately to assess whether perceived exposure differed by gender and by educational level. Results are presented in Tabel 2.

Table 2: Results of Kruskal-Wallis tests

ISCO Supergroup	KW Statistic (Gender)	p-value (Gender)	KW Statistic (Education)	p-value (Education)
Managers (ISCO 1)	1,309	0,520	0,847	0,357
Professionals (ISCO 2)	2,033	0,362	0,172	0,678

ISCO Supergroup	KW Statistic (Gender)	p-value (Gender)	KW Statistic (Education)	p-value (Education)
Services & Manual (ISCO 4–9)	0,128	0,720	4,160	0,041
Technicians (ISCO 3)	0,034	0,853	2,274	0,132

Source: Survey data processed by the authors in Python

Across major groups, no statistically significant gender-based differences were observed. Male and female respondents perceived similar AI Exposure within the same occupational group. For educational level, only the Professionals group had sufficient cases to perform test and the results were also non-significant differences ($p > 0.24$). Overall, these findings indicate that perceptions remain relatively homogenous within each category, regardless of gender or educational background. These orientations should not be reduced to mere estimation errors; rather, they represent expressions of professional identity and cognitive strategies for managing uncertainty. Emotions such as curiosity, fear, and hope play a key role in shaping these perceptions. Overall, the findings reveal a generalized ambivalence in how young people relate to AI: curiosity mixed with caution, information tempered by vulnerability. This ambivalence underscores the need for critical digital literacy and educational spaces that encourage reflection on one's personal relationship with technology. Rather than categorizing perceptions as "right" or "wrong," it is more productive to interpret them as indicators of how the emerging generation internalizes the transformations of the labor market. These insights invite deeper reflection on how young people's perceptions may influence educational choices, career orientation, and strategies for adapting to an increasingly AI-driven economy.

5. Conclusions

In this study, we aimed to identify how young people perceive the exposure of their desired future occupations to Artificial Intelligence (AI) and to explore whether these perceptions reflect predominantly pessimistic, realistic, or optimistic expectations about the future of work. Overall, we can conclude that there is a divergence between quantitative model and human perception. As possible interpretation hypothesis we mention the invulnerability bias (Barrera-Jimenez et al., 2025), when respondents underestimating AI exposure in their desired jobs and believe that AI will affect others' jobs more than their own jobs, correlated with limited understanding of how AI automates specific task. Another cause could be the optimism bias, when individuals minimize automation risk to preserve career confidence. We should also consider, as a possible interpretation, the generalization of the model, specifically, how it applies its calculations of AI Exposure across different occupations based on the composition of tasks within each occupation. This study demonstrates that young people's perceptions of artificial intelligence (AI) extend beyond technical assessments and reflect a complex understanding shaped by symbolic, emotional, and identity-related factors. AI is perceived as a transformative force with the potential to redefine both the structure and

meaning of work, and this perception varies significantly depending on occupational field, gender, and professional aspirations. These differentiated perceptions (ranging from cautious realism to optimistic underestimation) highlight the role of professional identity in shaping attitudes toward technological change. They influence not only career choices but also how young people prepare for integration into a digitalized economy. The findings underscore the importance of developing differentiated educational policies that account for the diversity of perceptions and the specific needs of each demographic segment. Digital competence and critical thinking about AI should be embedded across the curriculum, not only in STEM disciplines, but also in the humanities, social sciences, and creative fields. This approach can help ensure equitable and flexible preparation for a labor market in continuous transformation. From an economic perspective, young people's perceptions of AI may shape labor supply dynamics, levels of professional adaptability, and the degree of openness to technological innovation. In this sense, AI is not merely a technological challenge, but also a marker of society's capacity to manage change. Understanding these perceptions is essential for designing sustainable strategies for integrating AI into the economy, with a focus on inclusion, resilience, and innovation.

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INTRODUCTION IN THE FORMS OF DIGITALIZATION IN COMPANIES

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Abstract: *Digitalization has become a central theme in both academic and professional domains, driven by rapid technological advancements and the growing demand for systematic transformation. This study conducts a comprehensive literature-based analysis to identify the main forms, trends and conceptual developments associated with digitalization in companies. The findings reveal an increasing scholarly focus on topics such as digital transformation, artificial intelligence, Industry 4.0 and e-governance. Additionally, results point to a diversification of digital applications across sectors including education, healthcare, public administration and agriculture. By offering a structured and critical overview of the literature, this study enhances the understanding of the multidimensional scope of digitalization and outlines future research directions.*

Keywords: *digitalization; digital transformation; platform economy; business model; digital strategy; analysis.*

JEL classification: *M15, M21*

1.Introduction

In recent years, digitalization has become a central focus of academic inquiry and business innovation, impacting key areas such as education, public administration, healthcare, and corporate strategy. While numerous studies have explored the implications of digitalization from sector – specific perspectives such as its effects on higher education (Diaz – Garcia et al, 2022), or on public sector efficiency (Cazan, 2022), there remains a need for a synthesized view that captures the multifaceted nature of digital transformation within companies.

Digital tools are increasingly facilitating collaboration between students, educators and institutions, with online learning platforms and digital communication tools enhancing interaction and knowledge. In the educational sector, digitalization not only transforms teaching methodologies but also broadens access to learning, equipping students with competencies for a digitally – driven world.

In the healthcare domain, digitalization enables remote consultation, overcoming geographic constraints and offering critical solutions during emergencies such as the COVID – 19 pandemics. These developments have significantly improved the accessibility, efficiency and overall quality of medical services. From digitized administrative records to telemedicine platforms, the digital shift in healthcare is reshaping both patient experiences and health system management.

Despite these advancements, the literature remains fragmented and often lacks a clear theoretical integration. Therefore, this study aims to analyze and synthesize key

academic contributions, identify trends and conceptual shifts and provide a foundation for future research on digitalization in business contexts.

2. Research Methodology

The study adopts a systematic literature review methodology in order to investigate the evolving forms and conceptual developments of digitalization in companies. The research focuses on academic literature up to 2024, indexed in the Web of Science Core Collection, with the goal of mapping key trends, thematic areas and analytical perspectives.

2.1. Objectives of the study

The primary objectives of this research are as follows: to identify and categorize the main forms and dimensions of digitalization in business contexts; to synthesize conceptual trends and theoretical perspectives related to digital transformation; outline emerging directions for future academic inquiry and practical application.

2.2. Literature selection and search strategy

The search strategy was conducted in the Web of Science database using a combination of keywords, including: digitalization, digital transformation, digital business models, platform economy, artificial intelligence in business. The following inclusion criteria were applied: peer – reviewed journal articles published in English; publication focusing on company – level or sectoral implementations of digitalization; studies with theoretical, empirical or conceptual relevance to the business environment.

3. Digitalization of Business in International Companies

The digital transformation of companies is not merely about adopting new technologies; it is a strategic process that involves the continuous improvement of business operation, the standardization of processes and the integration of digital tools across both internal and external business networks. Companies undergoing digital transformation are fundamentally rethinking their business models to improve efficiency and enhance their value propositions for consumers.

As noted by Barmuta et al. (2020), a critical aspect of digital transformation is the acquisition of human resources who possess the necessary skills and knowledge to operate in a digitalized environment. This includes not only technological expertise but also the agility to implement digital solutions across various business functions. Transforming business operations requires regular evaluation of customer satisfaction and feedback to ensure that digital solutions meet consumer demands effectively.

According to Treyak et al. (2021), international companies are distancing themselves from traditional paper – based technologies in favor of integrated digital systems that streamline business management. The creation of large – scale databases enable the simplification of managerial processes, allowing for more efficient decision-making. These companies are actively engaged in adapting and consolidating operating programs to create comprehensive digital ecosystems. The product of this digitization is not only software but also the integration of these tools within the company's core business processes, leading to increased operational efficiency and customer

satisfaction. Digitalization can be assessed through three main directions: *digital transformation*: the complete overhaul of traditional business models into digital platforms, *emergence of new IT services*: developing digital tools and services that enhance existing business models, *digital automation*: digitizing traditional business processes to improve efficiency.

Tretyak et al. (2021) proposed a visual model for monitoring and assessing digitalization processes within companies, which aids in understanding how businesses can strategically manage their digital transformation. Figure 1 below represents the digitalization monitoring framework.

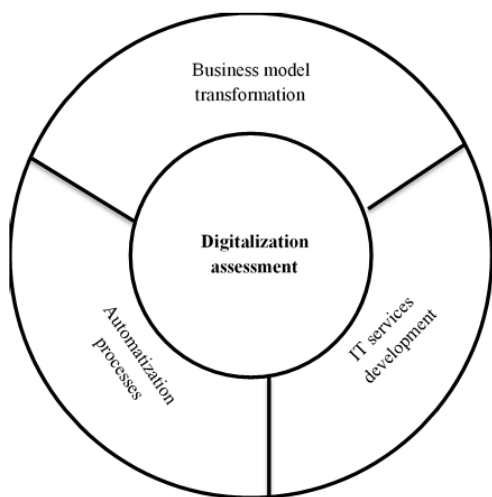


Figure 1. Digitalization monitoring and assessment in companies

Source: Tretyak1 et al. (2021)

The digital transformation process extends beyond the traditional realm of IT infrastructure; it necessitates a profound change in organizational strategies, business processes, innovation mechanisms and governance structures. This shift has led to the development of new ways to organize firms' value chains and inter-organizational relationships, increasingly situated within digital ecosystems and markets. As Cennamo et al. (2020) argue the „scope of transformation” refers to the depth of changes brought about by digitalization in the organizational framework, while „ways of co-generation and delivery of value” focuses on how firms create and deliver value collaboratively within digital ecosystems.

To remain competitive, firms must also navigate the transition from traditional pipeline-based business models to platform-based models. Van Alstyne et al. (2016) emphasize that success in the platform economy requires managing networks and creating dynamic ecosystems that foster collaboration and value exchange.

Furthermore, digital platforms are increasingly driving customer entrepreneurship an emerging form of innovation that enables consumers to actively participate in the creation of value. This model, as discussed by Park et al. (2020), presents new opportunities and challenges for traditional firms, particularly in terms of relationship management and the development of sustainable business ecosystems.

Klimanov & Tretyak (2019) advocate for a **systemic and relational view** of business models, highlighting networks as crucial sources of value, innovation, and competitive advantage. Instead of focusing solely on internal operations, this model examines **how firms interact with others** to co-create and deliver value. This perspective is essential for understanding businesses in the digital age and the platform economy.

Supply chain survivability during crises requires: fast and flexible operations, investment in digital infrastructure, strong collaboration and diversified sourcing. COVID -19 accelerated the move toward resilient, digital, and decentralized supply chain models. Future readiness depends on strategic thinking paired with operational agility (Sharma et al, 2020).

4. Forms of digitalization in companies

Digital platforms have emerged as one of the most significant innovations in business models over the past two decades. A digital platform is an organization that primarily creates value by enabling direct interactions between two or more types of affiliated clients, Tretyak et al. (2021). These platforms facilitate interactions, create new business opportunities, and provide efficient scalable solutions to meet the diverse needs of users.

Leonardi (2020) suggests that digital transformation involves six interconnected phases crucial for its success: leadership commitment, technology utilization, employee adoption, data - driven behavior change, local performance enhancement, alignment with corporate goals.

At the core of this transformation process lies business model (BM), which serves as the bridge between business processes and strategic planning. Rachinger et al. (2018) refer the business logic triangle, where business processes are situated at the bottom, while strategic planning is positioned at the top. The architectural level, represented by the BM, defines how value is created and captured by offering specific value propositions to customers (Teece, 2018). This model is essential for understanding how businesses navigate their digital transformation.

Linde et al, (2021), outline a three-phase evaluation framework that companies can use to assess digital business model opportunities before final commercialization: assessing the value, managing risks, financial modeling.

The structured approach enables companies to navigate the complexities of adopting digital business models while managing risk and ensuring that these models align with their broader strategic goals.

One of the primary drivers of digitalization is Artificial Intelligence (AI). AI is revolutionizing industries by automating processes enhancing productivity and complementing human capabilities. Its application span across sectors, significantly altering business operations. AI's impact is particularly evident in sectors such as finance, healthcare and manufacturing where AI tools are utilized for predictive analytics decision - making and process optimization Krupa et al. (2024). Figure 2 illustrates a framework for evaluating digital business model opportunities.

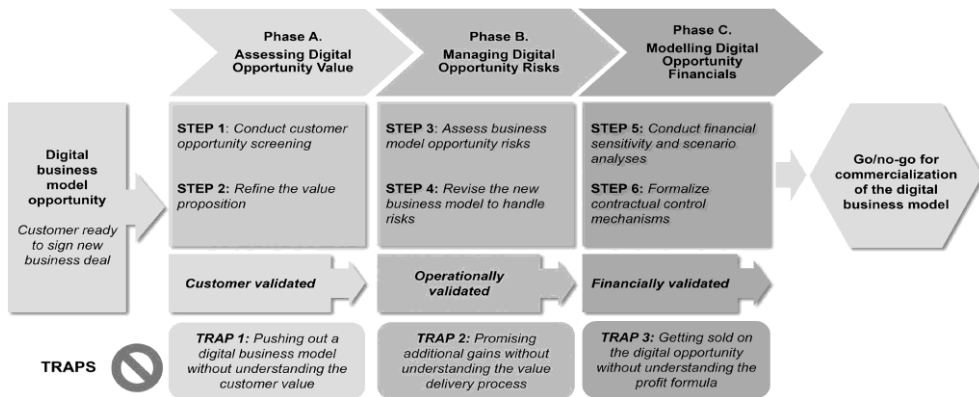


Figure 2. A framework to evaluate digital business model opportunities
Source: Linde et al. (2021), *Evaluation of Digital Business Model Opportunities*

In the financial service sector, the development of digital technologies has paved the way for financial technology (fintech), a new wave of innovation. Fintech offers faster more efficient processes and lower costs than traditional banking services. It encompasses a wide range of activities, including payment transactions, fundraising, insurance services and investment management, (Nizar, 2017). The rise of fintech has disrupted traditional banking systems and introduced new business models that leverage technology to meet consumer needs more effectively.

The digital transformation of a company is based on the continuous improvement of business processes, standardization, internal and external integration using digital technologies. In the course of the transformation, companies offer consumers new products and services, consumers participate in the design, testing, production and distribution of new products, which requires a regular evaluation of customer satisfaction. In addition, any company striving for transformation needs appropriate human resources with the knowledge and skills to work effectively in the digital environment and able to quickly implement digital projects (Parviainen et al. 2017).

Moreover, AI applications in finance are being used for predictive analytics, such as forecasting decision - making, bankruptcy prediction, credit rating, fraud detection systems, such as expert systems, are widely used in the financial sector to identify and mitigate fraudulent activities. Figure 3 below demonstrates the application of AI in finance and its significant role in transforming business operations within the financial sector.

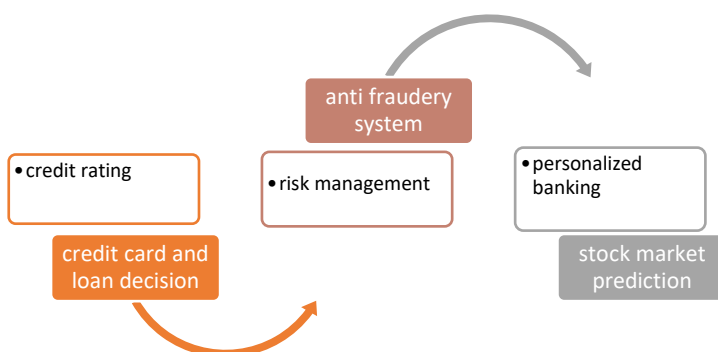


Figure 3. Artificial Intelligence in Finance

Source: Deepa. B et al. (2022), *Imperative Role of Integrating Digitalization in the Firm's Finance: A Technological Perspective*

5. Conclusion

Digitalization is perceived differently in the academic environment depending on the cultural context, technological infrastructure and the openness of institutions toward innovation. The study identified several key directions that reflect both positive perceptions and criticisms regarding the implementation of digitalization especially in education and healthcare. Positive perception: increased accessibility, flexibility, administrative efficiency, innovation in teaching.

Digitalization allows access to educational and informational resources from anywhere in the world, reducing geographical barriers and facilitating knowledge exchange. The learning process becomes more adaptable to individual student needs offering a more personalized education. Reducing bureaucracy and improving administrative efficiency are key positive aspects of digitalization in education and other sectors such as public administration. Digitalization enhances the educational experience by implementing new tools and platforms that facilitate interaction and collaboration between teachers and students.

In conclusion, digitalization represents a significant opportunity for improvement in various sectors such as education healthcare and public administration, but its implementation requires a careful approach that considers both the potential benefits and associated challenges. It is essential to understand the diversified impact of digitalization and develop strategies tailored to maximize its advantages and minimize its disadvantages. Furthermore, a balance must be struck between innovation and the protection of fundamental values such as equity, diversity and autonomy.

6. Limitations and Further Research

The limitations of this research stem primarily from the non-exhaustive nature of the existing specialized literature. Furthermore, the article addresses the forms of digitalization in a broad and generalized manner, without offering an in-depth analysis of how digital implementation varies according to company size, geographical location, or industry sector. Future research would benefit from the inclusion of qualitative case studies to explore, in greater detail, how organizations adopt and adapt digital strategies in practice.

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A BRIEF LITERATURE REVIEW ON DIMENSIONS AND MODELS FOR EVALUATING HOTEL SERVICE QUALITY

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Abstract: *This paper provides a brief literature review on the key dimensions used to evaluate hotel service quality, based on academic research indexed in the SCOPUS database. As the hospitality industry faces increasing competition and evolving customer expectations, understanding how service quality is measured becomes essential for improving guest satisfaction and fostering loyalty. The review highlights the most widely used conceptual frameworks and evaluation models, including SERVQUAL, DINESERV, and other customer-centric approaches. Particular attention is given to the multidimensional nature of service quality, encompassing reliability, responsiveness, assurance, empathy, and tangibles. Additionally, the study discusses recent advancements in measurement tools, such as the incorporation of online reviews, emotional responses, and memory-related constructs. The findings underline the importance of context-specific adaptation of these models and propose directions for future empirical research in various cultural and economic settings.*

Keywords: *hotel; quality; evaluation; models*

J.E.L Classification: *Z32; M21*

1. Introduction

Tourism represents one of the most complex global industries, deeply interconnected with the broader society and often seen as a barometer for societal development. The decision-making process of tourists when choosing a destination is increasingly influenced by past experiences and their ability to recall them, a factor highlighted by Kim (2022) as crucial in shaping future behavior.

The assertion that “we live in a changing society,” as noted by Saleem et al. (2024), has never been more relevant. The expansion of the sharing economy across industries has transformed consumer expectations, behaviors, and lifestyles worldwide. Within this context, service quality becomes essential for managing customer satisfaction, particularly in tourism and hospitality (Park et al., 2023).

The success of hotel operations hinges on the effective management of service quality. Understanding the key factors that influence customer satisfaction allows hotel managers to strategically improve their services, aiming for increased loyalty and long-term competitiveness (Padlee et al., 2019; Sharma & Srivastava, 2018). This is particularly important in an era when online reviews and electronic word-of-mouth (eWOM) significantly influence consumer decisions (Yang et al., 2017).

Recent research trends show a shift from traditional quantitative methods to digital data sources, such as online review platforms (Alrawadieh & Law, 2019; Padma & Ahn,

2019), which provide real-time insights into customer perceptions. The efficiency of any tourism market relies on the consumer's ability to evaluate the value of services before, during, and after consumption. The easier and more accurate these evaluations are, the more effective the market becomes.

When faced with the decision of whether to return to a particular hotel, consumers consider not only personal experience but also how well the business model and market positioning align with their expectations (Raynor & Mumtaz, 2016). The continuous improvement of service quality, based on both customer feedback and competitor analysis, becomes an essential managerial responsibility.

Moreover, as Anwar (2017) suggests, involving the customer in service processes is vital for success in the hospitality industry. This requires a 24/7 commitment to responsiveness and empathy, supported by well-trained and engaged human resources. Hameed and Anwar (2018) emphasize the importance of managerial efforts to ensure hotel reliability and trust—both internally, among employees, and externally, toward guests.

In efforts to assess service quality and customer experience, researchers have proposed various evaluation scales in tourism. These include the Tourist Role Typology Scale (Jenkins, 1982; Jiang et al., 2000), the Tourism Market Regulation Scale (Liu et al., 2020), and the Tourism Memory Characteristics Scale (Kim et al., 2022), among others.

Jenkins (1982) introduced an attitudinal scale for measuring tourist roles, identifying three dimensions of international tourist typology related to novelty-seeking behavior. While reliable, this scale was found to be more effective when used in combination with additional measures. Jiang (2000) expanded this framework by examining tourists' self-perception as part of a mass or independent group ("Demas"), further enriching the analysis of novelty-seeking tendencies.

Liu et al. (2020), responding to a gap in the literature, developed the Tourism Market Regulation (TMR) Scale from the tourist's perspective. Their work identified five key dimensions: regulatory oversight, truth in advertising, contract compliance, contract fulfillment, and travel feedback processing. This instrument provides a valuable tool for both tourists and destination marketing organizations in assessing regulatory quality across different regions.

2. Methodology

This study employs a structured literature review methodology to investigate how hotel service quality has been conceptualized and measured in academic research. The review focuses on identifying key models, dimensions, and evaluation scales used in the hospitality industry, with particular attention to developments over the past two decades.

The primary data source used for this review is the SCOPUS, due to its comprehensive indexing of high-quality, peer-reviewed journals across disciplines relevant to tourism, hospitality, and service management.

A systematic search was conducted using a combination of the following keywords: "hotel service quality" and then ". Boolean operators (AND, OR) were used to refine results, and filters were applied to limit the search to articles published between 2000

and 2024, written in English, and indexed as Articles or Reviews in the fields of Hospitality, Tourism, Business, and Management.

The selection process followed included four stages (Figure 1):

- Identification – A total number of articles were retrieved based on the initial keyword search.
- Screening – Duplicates and irrelevant titles were removed based on abstract and title relevance.
- Eligibility – Full texts of the remaining studies were examined for alignment with the inclusion criteria (focus on service quality in hotel settings).
- Inclusion – Final studies included in the review were those offering conceptual models, empirical analyses, or validated measurement scales relevant to hotel service quality.



Figure 1 Article selection from SCOPUS basedata
(Source: Scopus, Accessed in 01 April 2025)

3. Literature reviews on hotel service quality studies

In Tables 1 and 2, we have provided a brief synthesis of the hotel service quality dimensions identified in the articles (or their substitutes), and we have attempted to identify the evaluation model used, whether it is a classical one, a derivative, or proposed by the authors. In some cases, these dimensions directly reflect established theoretical models such as SERVQUAL, while in others, they are adapted versions or entirely new constructs derived from empirical research or qualitative analysis, such as topic modeling of online reviews. Alongside this, we attempted to identify the specific evaluation framework employed in each study—whether it follows a traditional model, builds upon an existing one, or introduces a novel conceptual approach developed by the authors themselves. This overview offers insight into both the consistency and variability in how service quality and customer satisfaction are conceptualized and measured in contemporary hospitality research.

The literature on service quality evaluation (Table 1) reveals a broad and evolving set of dimensions that reflect both traditional service attributes and emerging contextual and technological factors. Classical models such as SERVQUAL and its variants continue to dominate, emphasizing dimensions like tangibility, responsiveness, reliability, assurance, and empathy (Benaglia et al., 2024; Lam & Nguyen, 2024;

Asgeirsson et al., 2024). However, newer studies incorporate additional elements such as safety precautions and physical environment (Benaglia et al., 2024), justice dimensions (Tengilimoglu & Öztürk, 2024), and even reputation. Other approaches highlight psychological and perceptual constructs such as discomfort, agency, and meta-perception (Pitardi et al., 2024), or explore affective and cognitive evaluations derived from user-generated content (Yu et al., 2022; Vo et al., 2022). Topic modeling and content analysis further expand the dimensional landscape by identifying latent themes related to employee treatment, organizational culture, and sustainability practices (Stamolampros & Dousios, 2024; Baratta & Simeoni, 2021; Arıcı et al., 2022). Technological integration, such as blockchain and financial indicators, also plays a role in shaping perceptions of quality (Karim et al., 2023; Alexakis et al., 2021). Overall, the literature underscores that service quality is a multidimensional construct encompassing both objective features and subjective experiences, influenced by operational, emotional, social, and digital dynamics.

Table 1 Service Quality Evaluation Dimensions

No.	Authors	Service Quality Evaluation Dimensions
1.	Pitardi, Wirtz, Paluch, Kunz, 2024	No standardized model applied; focus on 'discomfort', 'agency', 'meta-perception'
2.	Benaglia, Ho, Tsai, 2024	Adapted SERVQUAL: tangibility, responsiveness, reliability, assurance, empathy + 'safety precautions', 'safe physical environment'
3.	Lam, Nguyen, 2024	DINESERV: tangibility, responsiveness, reliability, assurance, empathy
4.	Tengilimoglu, Öztürk, 2024	Perceived justice (distributive, procedural, interactional)
5.	Asgeirsson, Gudlaugsson, Jóhannesson, 2024	Modified SERVQUAL (reliability, assurance, tangibility, empathy, responsiveness); plus, reputation
6.	Stamolampros, Dousios, 2024	Latent themes via topic modelling: employee treatment, work-life balance, company culture, compensation, management behavior
7.	Karim, Rabiul, Ishrat, Promsivapallop, Kawser, 2023	Perceived service quality in relation to blockchain payment systems
8.	Wąsowicz-Zaborek, 2023	SERVQUAL dimensions inferred via content analysis (location, cleanliness, staff, etc.)
9.	Vo, Hung, Tuckova, Pham, Nguyen, 2022	Online review content: feedback, management responses, perceived service quality via user-generated content
10	Cheraghalizadeh, Dědková, 2022	Service quality + social media marketing → brand awareness, brand image, satisfaction

11	Yu, Cheng, Yang, Yu, 2022	Affective evaluation, cognitive effort from online reviews
12	Arıcı, Arıcı, Altınay, 2022	Green service quality themes from online reviews via Leximancer (e.g., room, staff, food)
13	Baratta, Simeoni, 2021	Perceptions of sustainability practices (e.g., local food, energy saving, recycling) and their impact on satisfaction and willingness to pay
14	Alexakis, Dowling, Pappas, Ramachandiran, Skalvos, 2021	Financial indicators as proxies for service quality (e.g., investment in services, revenue per bed)
15	Alzoubi, Vij, Vij, Hanaysha, 2021	What leads guests to satisfaction and loyalty in UAE five-star hotels? AHP analysis to service quality dimensions
16	Le, Nguyen, Le, 2020	Customer Satisfaction in Hotel Services: A Case Study of Thanh Hoa Province, Vietnam
17	Moro, Lopes, Esmerado, Botelho, 2020	Service quality in airport hotel chains through the lens of online reviewers
18	Guan, Choi	The impact of factors forming employee service attitude on service quality, customer satisfaction and loyalty
19	Nunkoo, Teeroovengadum, Ringle, Sunnassee, 2020	Service quality and customer satisfaction: The moderating effects of hotel star rating
20	Wong, Yang, 2020	A quarantined lodging stay: The buffering effect of service quality

(Source: created by author)

The evolution of consumer satisfaction models in the literature (Table 2) reflects a clear shift from standardized frameworks toward more context-sensitive, data-driven, and multidimensional approaches. Early models rooted in SERVQUAL principles continue to inform analyses through dimensions like responsiveness, empathy, and assurance (Alzoubi et al., 2021), often combined with constructs such as brand image or perceived value (Le et al., 2020). However, recent research increasingly adopts structural, mediated, or moderated models that integrate variables like trust, authenticity, privacy, and environmental factors (Benaglia et al., 2024; Lam & Nguyen, 2024; Karim et al., 2023). Novel conceptualizations, such as the QuReP model linking quality and reputation (Asgeirsson et al., 2024) or the proprietary model of agency and metaperception (Pitardi et al., 2024), point to theoretical diversification. Moreover, the use of big data analytics and unsupervised learning (Stamolampros & Dousios, 2024; Moro et al., 2020) highlights a methodological evolution, enabling the capture of latent drivers of satisfaction directly from user-generated or employee-derived content. Satisfaction is also frequently positioned as a mediator or outcome in complex causal chains involving loyalty, engagement, and customer behavior (Vo et al., 2022; Cheraghalizadeh & Dědková, 2022; Tengilimoglu & Öztürk, 2024). Overall, the

trajectory of satisfaction modeling reveals a growing emphasis on integration, contextual nuance, and analytical sophistication, adapting classical foundations to contemporary consumer experiences and technological realities.

Table 2 Consumer Satisfaction Model

No.	Authors	Consumer Satisfaction Model
1.	Pitardi, Wirtz, Paluch, Kunz, 2024	Proprietary theoretical model: agency → metaperception → satisfaction
2.	Benaglia, Ho, Tsai, 2024	Structural model with trust as mediator; satisfaction influenced by service quality, environment, precautions
3.	Lam, Nguyen, 2024	DINESERV; satisfaction partially mediates authenticity → eWOM; services indirectly mediate authenticity → satisfaction
4.	Tengilimoglu, Öztürk, 2024	Recovery satisfaction → customer citizenship behavior; model moderated by failure severity
5.	Asgeirsson, Gudlaugsson, Jóhannesson, 2024	QuReP Model: quality + reputation → satisfaction and loyalty
6.	Stamolampros, Dousios, 2024	No classical model; unsupervised machine learning (LDA topic modelling) based on Glassdoor employee reviews
7.	Karim, Rabiul, Ishrat, Promsivapallop, Kawser, 2023	Mediated model: blockchain → privacy/security + satisfaction → loyalty intention
8.	Wąsowicz-Zaborek, 2023	Exploratory: user-generated content compared with SERVQUAL; suggests updates to model
9.	Vo, Hung, Tuckova, Pham, Nguyen, 2022	Customer satisfaction → engagement → loyalty; e-WOM as driver of perceived service quality
10	Cheraghalizadeh, Dědková, 2022	Satisfaction, brand image, awareness mediate quality/social media → customer retention
11	Yu, Cheng, Yang, Yu, 2022	SCCT-based model; crisis response strategy moderates affective/cognitive inputs → satisfaction
12	Arıcı, Arıcı, Altınay, 2022	Big data-driven model linking perceived green practices → satisfaction
13	Baratta, Simeoni, 2021	Behavioral intentions influenced by perceived quality and comfort related to environmental practices
14	Alexakis, Dowling, Pappas, Ramachandiran, Skalvos, 2021	TripAdvisor ratings explained via offline financial data as proxies for perceived service quality
15	Alzoubi, Vij, Vij, Hanaysha, 2021	Responsiveness, empathy, reliability, assurance (SERVQUAL-inspired)

16	Le, Nguyen, Le, 2020	Perceived quality (intangible and tangible), brand image, perceived value, customer relationship management
17	Moro, Lopes, Esmerado, Botelho, 2020	Topic modeling: staff, food & beverage, cleanliness, punctuality, transport
18	Guan, Choi	Employee attitude (emotional intelligence, role clarity), service behavior
19	Nunkoo, Teeroovengadum, Ringle, Sunnassee, 2020	Accommodation infrastructure, employee expertise, room quality, safety, waiting time, customer interaction
20	Wong, Yang, 2020	Perceived service quality (staff warmth, care, responsiveness)

(Source: created by author)

4. Conclusion

The comparative analysis of recent academic literature reveals both convergence and diversification in the way hotel service quality and customer satisfaction are evaluated. While many studies continue to rely on classical models such as SERVQUAL or its adapted versions like DINESERV, an increasing number of researchers are incorporating more context-sensitive approaches. These include models tailored to specific segments (e.g., green hotels, airport hotels, or quarantine lodging) and the integration of modern techniques such as big data analytics and text mining. Moreover, customer satisfaction is frequently modeled as a mediator between service quality and behavioral outcomes such as loyalty, engagement, or electronic word-of-mouth, underscoring its central role in hospitality research.

The trend toward personalized service, emotional engagement, and digital interaction suggests a need for more dynamic and adaptable evaluation tools that go beyond static survey-based assessments.

One limitation of this review is its reliance on a selected set of recent peer-reviewed articles, which, while diverse in geographic and methodological scope, may not fully represent the broader body of hospitality research. Additionally, the synthesis is based on reported models and may not capture nuances in operationalization or context-specific adaptations unless explicitly stated by the authors.

Future research could explore cross-cultural validation of both classical and newly proposed service quality models, especially in emerging tourism markets. There is also a growing opportunity to integrate machine learning and real-time customer feedback into evaluation frameworks. Further, longitudinal studies could provide deeper insights into how customer satisfaction drivers evolve in response to global crises, technological innovation, and shifting consumer values.

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THE CITY OF ORADEA – A SUCCESSFUL TOURIST DESTINATION

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Abstract: *In recent years, the city of Oradea, located in northwestern Romania, has stood out as a model of good practice in tourism development. The Oradea case study highlights the joint efforts of the public and private sectors, along with strategic planning and the implementation of innovative actions, which have significantly contributed to Oradea's transformation into a point of attraction both nationally and internationally. Among the most notable initiatives are the restoration and valorization of the Art Nouveau heritage, the creation and promotion of the city's tourism brand, and the organization of numerous cultural events (such as open-air concerts, Christmas and Easter fairs, the Transylvania International Film Festival – TIFF, the City Days festival, and the Gaudeamus Book Fair), all aimed at attracting tourists throughout the year. The projects carried out in the field of tourism focused on developing a welcoming urban environment that highlights the history, architectural wealth of the city while creating a perfect balance between urban hustle and outdoor relaxation. The Oradea and Region Tourism Promotion Association (APTOR) plays an essential role in increasing the visibility of the destination and revitalizing areas with significant tourism potential. The association has launched several innovative initiatives (the "Oradea with Love" campaign, free guided tours, the Oradea City Hunt project and the creation of a customer relationship management (CRM) system) with the aim of increasing awareness and accessibility to the city's main tourist attractions. Also, the awards obtained by Oradea in the last two years, (Oradea – winner of the title "Art Nouveau Destination in Europe" and the title "Destination of the Year" 2025) shape the image of the city as a successful tourist destination.*

Keywords: *urban tourism, Art-Nouveau, APTOR, city brand, Oradea.*

JEL Classification: Z32

1. Introduction

Tourism plays a significant role in the European Union's economy, substantially contributing to economic growth, employment generator, and social progress (Trip *et al.*, 2021). According to Eurostat, in 2024, over 3 billion nights were spent in tourist accommodations across the EU (a 2.2% increase from 2023). Countries like Spain (500 million), Italy (458 million), France (451 million) and Germany (441 million) registered the highest number of nights spent at tourist accommodation establishments, representing 61.6% of the total nights spent in the EU, confirming their position as Europe's top destinations (Eurostat, 2025). A significant milestone in 2024 was the

complete integration of Bulgaria and Romania into the Schengen Area. The removal of land border controls has facilitated the free movement of people across 29 European countries. This expansion reinforces mobility within the European Union and will boost travel, trade and tourism in Southeast Europe (European Commission, 2025). Many Romanian towns, with histories stretching back thousands of years, have chosen to build an authentic future rooted in their ancestral heritage, rather than rushing toward rapid development. Located approximately 8 miles east of Romania's border with Hungary and extending along both banks of the Crișul Repede River, the refined city of Oradea serves as a distinguished entry point into Romania for travelers arriving by car or train from Central Europe. Compared to other important tourist destinations in Romania, it has consolidated its position in the top tourist destinations in the country, occupying 8th place, the same position as in 2024, being one of the most attractive locations for tourists.

Table no.1 Top tourist destinations in Romania (2024)

Important tourist destinations Romania	Tourist arrivals (number of individuals)
1. Bucharest	2.005.391
2. Brașov	744.389
3. Constanța	528.775
4. Cluj-Napoca	501.683
5. Sibiu	411.860
6. Iași	340.202
7. Timișoara	286.614
8. Oradea	243.196
9. Târgu Mureș	168.926
10. Suceava	135.524

Source: compiled by the author based on data provided by <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table>

The increase in the number of overnight stays reflects the diversity of recreational activities and the attractiveness of organized events, with the average length of stay exceeding 3 days. If 2023 represented a continuation of the recovery that began in 2022, 2024 represented the year of reaching or even exceeding pre-pandemic values. Thus, in 2024, the number of overnight stays in Oradea increased by over 8% compared to 2023, representing the first year exceeding the overnight stays before the pandemic, the reference year 2019. In terms of individual arrivals, in 2024 Oradea recorded a number of 243,196 tourists, which represents an increase of approximately 9% compared to 2023, being 10% above the values recorded in 2019. The accommodation capacity of the destination, according to the INS, increased from 77 accommodation units in 2023 to 86 in 2024, double compared to 2019 (TEMPO Online, 2024).

2. Urban Tourism. A Theoretical Overview

Tourism, as one of the fundamental pillars of urban development, exerts a significant influence on the economic, social, and spatial configuration of cities worldwide, positioning it as a crucial element in contemporary urban development strategies (*UN Tourism*). Urban tourism can serve as a key catalyst for the development of cities and nations, aligning closely with the objectives of the New Urban Agenda and contributing directly to the achievement of the 17 Sustainable Development Goals, particularly Goal 11, which focuses on making cities inclusive, safe, resilient, and sustainable (*World Bank Group*).

Urban tourism stands out as one of the most dynamic and rapidly expanding forms of contemporary tourism (Panasiuk, 2019). The importance of urban tourism in stimulating economic growth (Postma *et al.*, 2017) is highlighted through its roles in generating revenue, creating jobs, and enhancing infrastructure and international visibility (Petrović *et al.*, 2024). Urban or metropolitan tourism is closely associated with destinations characterized by advanced urban infrastructure, which includes well-developed transport systems (tram, bus, subway) accommodation and food service facilities (hotels, restaurants, pubs) cultural institutions (museum, theatre, cinema, libraries) centers for sports and recreational activities (football/tennis stadium, ice skating rink) entertainment venues (outdoor concerts, film screenings) commercial areas (mall, market, fair) communal infrastructure (roads, highway, airport) and other services designed to meet the needs of both tourists and permanent residents (parks, bookstores, health services). The main motivations for choosing such destinations typically involve visiting tourist attractions, participating in cultural events, engaging in business or professional activities, attending sports events, maintaining family and social relationships, as well as engaging in commercial activities, particularly shopping (Panasiuk, 2019). Law (1992) adds that urban areas must meet several key criteria to function effectively as tourist destinations. Cities have large populations, which attract visitors coming to see friends and relatives. They also tend to have more developed attractions compared to other types of destinations. Accessibility is another major advantage, with urban areas typically well-connected through airports and regular transport services. Additionally, cities often have a wide range of accommodations originally built for business travelers. Urban destinations also appeal to multiple types of tourists by offering comprehensive infrastructure, including communication networks, transportation, services, and facilities that cater to visitor needs (Pavlic *et al.*, 2013). The “tourist city” has been defined as “an original novelty of our modernity” (d'Eramo, 2019 by Cristiano and Gonella, 2020). Cristiano and Gonella (2020) argued that future research agendas need to be framed using several concepts now emergent in the urban tourism literature: sustainability, resilience, management (Page *et al.*, 2023). In contemporary discourse, the term *urban conservation and regeneration* have gained prominence, emphasizing the integration of economic and social dimensions into urban conservation strategies and underscoring the importance of holistic, integrative planning approaches (Ramlee *et al.*, 2015).

3. Material and Methods

The research focuses on a selection of articles that explore concepts related to urban tourism and its role in the development of cities and communities. The case study on tourism in Oradea highlights the main initiatives undertaken by local authorities to

showcase the city's tourism potential. This study is based on information provided by official sources (local authorities, specialized institutions, statistical reports), which emphasize the key actions implemented over the past decade—such as projects and innovative initiatives—aimed at facilitating the transformation of Oradea into a major tourist attraction both nationally and internationally.

4. How Oradea Became a Tourism Success Story

The success of a tourist destination depends on several key factors: the creation of a successful partnership between the public sector, the private sector, and the local community; the establishment of a long-term strategy, and designing and promoting a representative city brand.

The Oradea and Region Tourism Promotion Association (APTOR), the destination management organization, was established in 2015 through a public-private partnership involving the most prominent local stakeholders: the Oradea City Hall, the Oradea Local Development Agency, the Oradea Metropolitan Area, the Lotus Centre Shopping Mall, DoubleTree by Hilton Oradea, Ramada by Wyndham Oradea, and Hotel President Băile Felix. As of November 2022, the Bihor Hospitality Association became a full member, thus becoming APTOR's eighth member. The Bihor Hospitality Association represents nearly 60 entrepreneurs from Oradea and Băile Felix who manage hotels, restaurants, cafés, and event venues. APTOR's primary objective is the development and implementation of the destination's tourism policy, through the design of an effective marketing strategy and the creation of local tourism products for commercial promotion. Another essential component of its activity is the establishment and strengthening of strategic partnerships at local, national, and international levels. At the same time, the association aims to develop visitor-oriented services and to curate an event agenda designed to enhance the destination's visibility and revitalize areas with tourism potential within Oradea (*Visit Oradea*, n.d.-a). The association's work is showcased through the platform titled *Visit Oradea*. For the promotion of the city of Oradea, APTOR has implemented a series of innovative initiatives, including: the "Oradea with Love" campaign, the organization of free guided tours, the "Oradea" City Hunt project, the development of a CRM system, among others.

4.1. "Oradea with Love" Campaign

The "Oradea with Love" campaign is organized by APTOR, with the support of Oradea City Hall, in partnership with OTL (Oradea Public Transport Company), the Bihor Foundation for the Protection of Historical Monuments (*Oradea Heritage*), local museum institutions, and hospitality sector businesses (accommodation and food services). The fifth edition took place between February 1st and December 31, 2024, offering tourists the following benefits (Oradea.ro, 2024):

- Free access to tourist attractions managed by the Bihor Foundation for the Protection of Historical Monuments (*Oradea Heritage*): the Oradea City Hall Tower, the Darvas-La Roche House, the Masonic Temple, the Sion Neolog Synagogue, and the Aachvas Rein Synagogue – the Jewish History Synagogue.

- Free access to all museum sections of the *Criș Country Museum – Oradea Museum Complex*: The Criș Country Museum, the Oradea City Museum – Oradea Fortress, the Aurel Lazăr Memorial Museum, the Ady Endre Memorial Museum, and the Iosif Vulcan Memorial Museum.
- Free public transportation for 24 hours throughout the OTL network.
- Attractive discounts at participating cafés and restaurants in Oradea.

Tourist registration, benefit code generation, and communication between campaign partners are managed via the website www.oradealifenouveau.ro, which ensures transparent communication between service providers and facilitates direct connectivity between accommodation units, museums, and the public transport network. Based on this unique code, the tourist will have access to all the benefits of the campaign. A code can be used only once and cannot be transferred, as it is personal. The 24-hour free use of the public transport network in Oradea will be activated by tourists by sending an SMS to a special OTL number. The "Oradea cu drag" campaign - 6th Edition was launched on March 1st, 2025 and will run until December 31, 2025. Tourists who stay a minimum of two nights at partner accommodations benefit, once again, from free access to tourist attractions, free transport for 24 hours and discounts at cafes and restaurants included in the program and, for the first time, discounts on spa and relaxation services (Bihoreanul, 2025a).

4.2. The Organization of Free Guided Tours

The project, initiated in 2022 and continued in the summer of 2023, was a real success, gathering 1,676 participants in the first two years, tourists and Oradea residents, eager to discover the history and architecture of the city of Oradea.

The project was also very popular in 2024, gathering 1,195 participants in 39 tours, between June 28 and September 15. The tours are organized in Romanian, English or Hungarian and last approximately 2.5 – 3 hours. These tourist circuits in Oradea are carried out by accredited tour guides, who are well-versed in the tourist potential of Oradea (*Visit Oradea*, n.d.-b).

4.3. The Oradea City Hunt Project

With the intention of increasing the activity of the destination among tourists, but also among locals, in 2024, Visit Oradea, in partnership with Spark Communication, launches a new initiative to promote and visit the destination: the Oradea CityHunt experience. This event is an interactive guided tour on a route of approximately four kilometers, with an estimated duration of three hours. Oradea CityHunt is a project that addresses everyone interested in discovering and getting to know Oradea more closely, to find out the little-known things about the architecture and history of the tourist destinations, in a unique and interactive way (Chișbora, 2024).

4.4. Development of a CRM System

The main purpose of the project "Strengthening the capacity to manage and coordinate tourism development at the level of the municipality of Oradea - VisIT Oradea" implemented during the period July 2022 - September 2023, was based on supporting the relaunch and development of Oradea tourism. Through the project, a CRM (Customer Relationship Management) system was developed for better communication, information transfer, data collection and results at the tourist destination

level. The system is a national innovation, which helps to efficiently manage, at the level of Visit Oradea, the relationships between local stakeholders and interested parties in the Oradea destination: tourists, potential tourists, bloggers, travel agencies, mass media, etc. This system allows the analysis of available data and the generation of reports to support local public policies in the field of tourism (*Visit Oradea*, n.d.-d).

4.5. City Brand of Oradea

Additionally, APTOR is responsible for designing and promoting a representative city brand, which is to be integrated across all promotional activities, the events agenda, and ongoing strategic collaborations (*Visit Oradea*, n.d.). On May 9, 2019, APTOR officially launched the city brand of Oradea, conceptualized in collaboration with the consultancy and design firm Brandient (Oradea.ro, 2019). The Oradea city brand employs a color palette inspired by the Art Nouveau style, reflecting the elegance and architectural diversity of the city. According to APTOR, the graphic symbol of the Oradea brand is the "Supercrown"—a circle composed of six colored icons, each representing a distinct element of the city's identity (Chișbora, 2019):

- golden crown symbolizing royalty and the historical past;
- purple crown highlighting the art-nouveau architecture of the city;
- green crown symbolizing nature and green spaces;
- blue crown representing the thermal waters of Oradea;
- orange crown indicating a multi-ethnic society, a cosmopolitan city;
- red heart symbolizing the hospitality of the people.



Fig.1 The Oradea city brand
Source: Oradea.ro (2019)

The chosen slogan, *Art Nouveau – Life Nouveau*, blends French and English and is rooted in the city's Art Nouveau heritage. According to APTOR, "the brand promise is 'Art Nouveau, Life Nouveau', a unique expression that unites the past, present, and future of this wonderful and blessed city." The organization also notes that "the Super crown symbol harmoniously captures the history, culture, and rich heritage of the city, while also standing as a symbol of tolerance and the acceptance of diversity in all its forms" (Chișbora, 2019).

5. Projects Implemented in the Field of Tourism

In the last 10 years, Oradea has implemented several projects that were based on developing the city's attractiveness. Among these projects, the following stand out:

- *valorization of the Art Nouveau heritage* - Oradea was accepted in 2011 as a partner in the Art Nouveau Cities Network. Thus, the Art Nouveau architectural heritage of Oradea is protected and promoted both locally, by the Oradea Heritage Foundation, and internationally through the Art Nouveau Network. Through the European project 'Art Nouveau as a New EUtopia' (New EUtopia), the Réseau Art Nouveau Network (RANN) and its partners want to invite contemporary artists from all disciplines (visual artists, writers, musicians,

choreographers, etc.) to reinterpret Art Nouveau works and their link with nature through the prism of the past and the present. Between 2024 and 2025, five of RANN's European partner cities will be setting up six artists' residencies: Aveiro in Portugal, Brussels (two venues) and Mons in Belgium, Nancy in France and Oradea in Romania (RANN, n.b.). On 5.04.2025, Oradea hosted a unique international symposium on the theme of Art Nouveau. The event entitled "Architecture-Art-Design 1900: A New Unity", took place at the Darvas-La Roche House, and was held in English by three renowned specialists in the field of architecture and art history: Paul Stirton, Professor Emeritus in Modern Design at the Bard Graduate Centre in New York and editor of 'West 86th: A Journal of Decorative Arts, Design History, and Material Culture'; Juliet Kinchin, former curator in Modern Design at the Museum of Modern Art, New York; and Professor Anthony Gall from Óbuda University in Budapest. The theme of the lectures was Art Nouveau/Secession art and architecture, the sources and characteristics of "new art" supported by examples from Scotland and Central Europe (Bihoreanul, 2025b).

- *creation of new cultural and exhibition spaces* - Titled "Oradea, a city with an artistic soul", the Pact for Culture was created out of the desire to help both the community that wants to participate in dedicated events, and the artists who face difficulties when they want to organize events. The Pact for Culture aims to provide concrete solutions to revitalize culture in Oradea and transform it into a driving force for the development of the city. (BIHON, 2024). The Oradea Arena Multipurpose Hall was inaugurated on April 20, 2022 and is the most modern multifunctional arena in Oradea. The architectural line of the construction and the historical atmosphere of the city bring events to life. From memorable concerts to sports competitions, the created space assumes the role of a bridge between tradition and modernity. Another ongoing project is the construction of the 17,778 square meters Multifunctional Cultural Centre. The building will be intended for cultural events, congresses and conferences on various themes. The centre will have a main hall and two secondary multifunctional halls, foyers and a co-working space with cultural specificity. At the beginning of 2025, the National Investment Company launched a new tender for the design and construction of a new football stadium in Oradea, with an area of 13,000 square meter and a capacity of 16,291 seats. The complex consists of 5 investment objectives: the stadium which will also have a hotel, a restaurant, conference rooms and a SPA centre (Chișbora, 2025). The 2024 calendar of events included 31 public events, some of which were already established, such as the Medieval Festival, Oradea Festifall, Christmas Fair, Sounds of Oradea Festival, Dilema Vechela Oradea Conferences, Unchain Fintech Festival, Oradea Nights Festival, but also unique events such as the European Ice Swimming Championship, the Robotics Championship Olympics or the extraordinary Andrea Bocelli concert (*Visit Oradea*, n.d.-b).
- *rehabilitation of the Oradea Fortress* - Oradea Fortress is one of the most important medieval monuments in Transylvania. Today, the Citadel Park is one of the most beautiful promenade spaces in the city. The versatility of the indoor and outdoor spaces within the Fortress provides an exceptional setting for

business events, in a location with a very strong historical and cultural background (*Visit Oradea*, n.d.-c).

- *construction of Nymphaea Aqua Park* - The project was completed in 2016, the main objectives being based on the diversification and improvement of tourist services in general, and leisure services in particular, offered to the residents of Oradea and tourists, raising the standard of tourist offer, sustainable and responsible exploitation of geothermal mineral resources.

5.1. Oradea - Tourist Resort of National Interest

The Romanian Government implemented in 2020, at the request of the Oradea municipality, a decision by which the city of Oradea becomes a tourist resort of national interest. With this status, Oradea, through the Historical Centre – Crișul Repede Corridor tourist area, has managed to more easily attract investments and European funds for the development of tourism. Given the high concentration of natural and anthropogenic resources, the areas for which the tourist resort status was obtained are: the central area of Oradea Municipality, with the historical monuments, starting from the Roman Catholic Basilica, the central pedestrian street, with everything that the historical centre means and going to the University, and the area of the Crișul Repede green corridor, starting from the Mareșal Prezan Bridge, the Nymphaea Aquapark, the Crișul Meadow, Dealul Ciuperca, Brătianu Park, crossing the central area, to Ștrandul Iloșia. According to Jurca M., director of APTOR *"by obtaining the status of a tourist resort of national interest, both the municipality of Oradea and the private sector economic agents will have the advantage of being able to access European and government funds, which otherwise could not be accessed, and the image of a tourist city will also be strengthened, being highlighted, along with the architectural heritage of the city, the possibilities of spa treatment that the municipality offers"* (Oradea.ro, 2020).

5.2. Oradea City Award Ceremony

Oradea – winner of the title “Art Nouveau Destination in Europe”
In 2024, Oradea was designated by Best European Destinations as the second most beautiful Art Nouveau destination in Europe. Oradea stands out for its buildings with refined ornamental details and a unique combination of architectural influences. The Art Nouveau style with Secession accents and influences, the Baroque style and the medieval star, give the city a special architectural value that has earned it the reputation of being the Art Nouveau capital of Romania (Ion, 2025a).

Oradea - winner of the title “Destination of the Year” 2025
Oradea won 1st place in the “Cities that inspire” category, at the “Destination of the Year 2025” Gala, held on 08.04.2025, in Sibiu. Oradea impressed the jury, the public and the experts with its spectacular urban transformation, the integration of Art Nouveau architecture and the promotion of sustainability as a pillar of tourism development. With modern public spaces, attractive pedestrian areas and a rehabilitated medieval fortress that has become a cultural landmark, Oradea surpassed cities such as Sibiu (2nd place) and Brașov (3rd place) in this competitive category (Ion, 2025b).

6. Promotion Strategy at Destination Level

In order to reach a diverse audience, the association's activity is present through various TV campaigns but also on most social networks: Facebook, Instagram, TikTok, YouTube, etc. through influencers and bloggers (such as: Călători în bascheți, Aer de vacanță, Hai Hui în doi, Christian Grossi, etc.). The city's promotion activity is also carried out by participating in tourism fairs organized at national and international levels. In order to attract a growing number of international tourists, in 2025, Oradea participated, through Visit Oradea, in the most important tourism fairs in Europe: Matka Nordic Travel Fair in Helsinki and Ferien-Messe Wien in Vienna (Oradea.ro, 2025a), ITB Berlin (Oradea.ro, 2025b) and BIT Milano (BIHON, 2025). These events provide an excellent opportunity to present the city's attractions to a wide audience, consisting of travel agencies, tour operators, specialized journalists and tourists interested in authentic destinations in Central and Eastern Europe. Oradea presents its offer, emphasizing (Oradea.ro, 2025a):

- the Art Nouveau architectural heritage, which makes the city unique in the European landscape;
- the thermal baths recognized for their curative effects;
- local gastronomy, inspired by the multicultural influences of the region;
- the cultural events and festivals that animate the city throughout the year;
- the tourist packages offered by Oradea hoteliers, etc.

7. Conclusion

In recent years, Oradea has undergone a remarkable transformation, becoming a success story in the field of sustainable development and the promotion of urban tourism. The city is distinguished by its exceptional architectural heritage (Art Nouveau capital), elegant and dynamic atmosphere, recent urban development and has also established itself as a significant landmark in the progress of urban tourism in Romania. Elements such as Art Nouveau buildings (the Black Eagle Palace, the Darvas-La Roche House and the Regina Maria Theatre) along with investments in infrastructure and lively vitality contribute to the creation of an urban identity in which the past and the present intertwine harmoniously. Reconfigured public spaces, interactive museums, as well as the network of cafes and concert venues support a complex and attractive tourist experience. Through its active presence at tourism fairs, APTOR reaffirms its mission to promote the city as a top tourist destination in 2025. Both completed projects and those currently under implementation aim to strengthen the city's visibility nationally and internationally, with the aim of attracting an increasing number of tourists and supporting the sustainable development of the local tourism sector.

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NEW WAYS OF DEVELOPMENT FOR RELIGIOUS TOURISM ATTRACTIONS – A CASE STUDY OF DEBRECEN, HUNGARY

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Abstract: Religiously motivated travel is one of the oldest forms of tourism, which involves millions of people even today. However, churches are visited not only by believers but also by secular tourists who are motivated by learning about the history and culture of a religious building, monument or site. Many of Hungary's diverse religious heritage sites now offer complex visitor experiences as a result of recent tourism developments. The primary aim of this paper is to demonstrate the opportunities of co-creating visitor experiences in churches and other religious tourism attraction through a case study approach. After a literature review on different aspects of religious tourism, three religious tourism attractions were examined, which may be considered as outstanding examples of the touristic use of religious heritage. A qualitative approach was utilized to explore the perspectives of tourism professionals concerning the interpretation of the church heritage. On-site observations and in-depth interviews with a tourism stakeholders (museum managers, guides of the exhibitions, museum pedagogy experts) were implemented to explore the potential of interpretation and experience co-creation at the chosen religious sites. The results indicate that the key to the survival of church heritage attractions is to incorporate modern innovations into museum practice, while respecting and complementing the heritage value. In the case of religious tourism, respect for sacred space is of paramount importance, and the tourism function should not negatively impact on the primary function of religious practice. Although the limitation of the present study lies in the fact that the demand side was investigated through on-site observation, the results may have implications for tourism experts working to find a second purpose for churches as tourism attractions.

Keywords: religious tourism; interpretation; heritage attractions

JEL Classification: Z32, O52

1. Introduction

Churches, religious monuments and sites as well as festivals and events, can be religious tourism attractions, but in many cases, they are also popular destinations for cultural tourism, and their visit is not necessarily motivated by religious reasons alone.

Visiting sacred buildings and places of worship can have a unique spiritual meaning for religious people, but can also have spiritual significance for non-religious visitors (Bartha, 2006). In our fast-paced world characterized by globalization and secularization, the individual's personal quest for happiness, peace and harmony is becoming dominant, which may motivate tourist to take part in spiritual travels to escape from everyday life (Domjáné Nyizsalovszki & Csáfor, 2023). The need for tranquillity and spirituality is steadily growing globally, although it is not always connected to a religious community (Gadácsi, 2022; P. Szászfalvi, 2018; Nair & Dileep, 2021). Churches are visited not only by religious believers but also by tourists with a cultural motivation seeking authentic and unique experiences (P. Szászfalvi, 2018). In addition to the well-known and frequently visited religious sites, the tangible and intangible values of religious heritage are often key elements in the offer of tourist destinations. At the same time church attendance in Europe is declining at most places and several churches have closed in Western Europe after their religious community had dissolved. Old churches belong to the historical heritage of a country, therefore there is often a considerable effort by local communities to find a new purpose for these buildings. Churches are often turned into community centers, tourist offices, apartments, restaurants or even pubs in Western cities in order to avoid demolition (e.g. Dublin, Tourism Centre, Church Cafe Bar and Restaurant in Dublin, Ireland, Champing Beaumaris, in Anglesey, Wales, etc.). Although churches have to face similar challenges in Hungary, giving churches and religious buildings a secular purpose is still not common. In our days, Christian denominations aim to maintain the original purpose of the churches, while opening the doors to a wider audience; the visitors motivated by cultural interest.

Our research is urged by the major tourism developments of the last decade in Hungary. Many of Hungary's diverse religious heritage sites now offer complex visitor experiences as a result of recent developments (MTÜ, 2021). The key to the success of religious tourism attractions is the cooperation between the tourism sector and churches. In the case of the historic churches, there is a clear desire to innovate and open up for tourism opportunities. The maintenance of the historic buildings consumes considerable financial and human resources, which would also require some form of profit-making economic activity in addition to the support of the community members. The maintenance and preservation of monumental buildings, some of which may be several centuries old, can be partly ensured by tourism revenues, and can also help to transmit values and traditions to the general public (Varga, 2011). In this case, the development of the revenue-generating capacity of religious tourism attractions is therefore motivated not by economic interests or profit-making, but by the need to preserve heritage (Raffay, et al., 2013). Following the latest trends, other tourism products, such as active tourism attractions and products, have been integrated into the tourism development practices of certain religious communities. Cycling tourism is often a good link between spiritual and active tourism. The churches of Eastern Hungary are visited by many cyclists who are also interested in the religious tourism attractions of the region, following the thematic route called the Route of the Medieval Churches. It has been recognized that religious buildings, especially churches, can be used for cultural purposes as well, such as concerts, lectures and concerts (P. Szászfalvi, 2018).

The last decade has seen a significant increase in the amount of funding available for the sector, which has helped to regenerate or create a number of church-related attractions in Hungary. Economic indicators (job creation, ticket revenue, number of visitors, etc.) have emerged as criteria for development tenders, which can only be met if the operators develop programmes and attractions with a business approach and in line with demand trends (Raffay et al, 2013). In our research, we analyze the religious tourism offer of the city of Debrecen, with special attention to the methods of interpretation of ecclesiastical cultural values. Although a plethora of work highlight the diversity of religious tourism attractions, the challenges and opportunities of religious tourism development in Eastern Europe have been left ambiguous.

Our aim is to present and evaluate religious tourism attractions that can serve as a model, i.e. that interpret the ecclesiastical heritage in a way that reflects the latest trends in visitor management, builds on the active participation of visitors and provides unique experiences. Furthermore, the present study also provides empirical insights into the challenges and opportunities arising from presenting the ecclesiastical heritage to the secular tourists.

2. Literature review

2.1 The concept of religious tourism and its demand side

Religiously motivated travel is one of the oldest forms of tourism (e.g. visits to churches or shrines, pilgrimages, etc.), which has attracted large crowds from ancient times to the present day. In a narrower sense, only pilgrimages, processions and other religious events can be included, where the focus of the faithful is on spirituality and transcendental experience, with tourist services playing a secondary role. This interpretation focuses on the transformative nature of religious tourism, which allows the tourist to grow spiritually during his or her journey, to become a 'different person' (Pécsek, 2023). Today, however, the concept is becoming more differentiated, and visits to churches and religious institutions, as well as cultural events in churches, can now be included in the concept of religious tourism (P. Szászfalvi, 2018). In a broader sense, it is therefore a form of travel in which 'believers and non-believers visit religious sites, not as sacred places, but as cultural, historical or artistic sites' (Varga, 2011). According to the latter approach, religious tourism is a product of cultural tourism, in which travelers are motivated by the search for values of artistic, historical, architectural and/or ethnographic significance. The demand for religious tourism is made up of two main segments: religious tourists who wish to experience their faith in a sacred place, and whose motivation is linked to their religious life, and secular tourists, who are motivated by the desire to visit built heritage sites and monuments, such as churches (Varga, 2011). According to the latter approach, the second group is much larger, as religious tourism attractions are also part of the global cultural heritage, which may therefore be of increased interest to non-believing travelers and motivate cultural trips. Nowadays, religious heritage sites are also domestic destinations for cultural tourism (Raffay et al, 2013).

There is also an increased demand for adventure and exploration with religious elements from active tourism visitors who want to complete their trip with a spiritual experience (Gadácsi, 2022). Hungary's National Strategy for the Development of Tourism identifies cultural culture, natural attractions, gastronomic experiences and

retreats as motivating factors for secular tourists (MTÜ, 2021). Religious tourism is also closely linked to heritage tourism, since learning about religious heritage and 'discovering the roots' can be both an important motivation for travelers and a unique attraction for the region, thus strengthening the competitiveness of the destination (Gonda, 2016). Heritage tourists are motivated by the desire to see built cultural heritage and to experience intangible cultural heritage, such as traditions and festivals (McNulty & Koff, 2014; Liritzis et al., 2015). Travelling can give tourists a sense of belonging to their homeland, while also creating intercultural awareness (Chang, 1999). In addition to social and cultural impacts, heritage tourism can also have positive economic effects by increasing employment opportunities and generating additional income for local society (Silberg, 1995). The religious attractions aiming to meet the needs of the differentiated demand (spiritual or cultural) need to introduce new, modern interpretation modes of the existing religious heritage.

2.2. New approaches to the interpretation of the ecclesiastical heritage

The spirituality of the built ecclesiastical heritage is of crucial importance, as it represents and presents the culture and identity of the destination to generations (Lee & Chhabra, 2015). The heritage value is captured by the tourist through interpretation, which conveys the knowledge necessary for a deeper understanding of the heritage in a creative and innovative way, often appealing to the emotions (Nuryanti, 1996). For a memorable visitor experience it is necessary to create a shared experience between the tourist and the service provider offering the programme. This means that the service provider's role is to involve the visitor in value creation, a process that is necessarily interactive and depends on the personality and cultural background of the recipient (Vargo & Lusch, 2018).

The main task of interpretation is to help individuals relate what they see to their identity (Kulcsár & Bodrogai, 2021), and it can also contribute to the development of positive attitudes towards culture among tourists (Weng et al., 2020). The main challenge of heritage tourism is the reconstruction of the past in the present through interpretation (Nuryanti, 1996), which can be done using a wide range of media, including digital tools (Happ et al., 2024). Some of the interpretive tools can be used for one-way communication, such as exhibitions, touch-screen information panels, audio-guides, while others can be used for two-way communication, such as guided visits or interactive digital games (Puczkó & Rátz, 2017). For heritage tourism sites, a particularly popular tool for guided visits is storytelling, which evokes people associated with the heritage asset, instead of listing factual historical information. Storytelling engages visitors not only intellectually but also emotionally in the experience. The presentation is often based on the history of the place, its people and events in the context of a historical period. At the same time, the visitor's willingness to engage is essential for a shared experience (Doyle & Kelliher, 2023; Vargáné Csobán & Molnár, 2022).

3. Materials and methods

The secondary research was based on a review of the national and international literature and a content analysis of the websites of the churches and religious institutions involved in the research. After a literature review on different aspects of religious

tourism, three religious tourism attractions were chosen for closer investigation, as they are considered the most outstanding examples of the touristic use of religious heritage and their touristic development has been recently implemented with a considerable amount of state funding. The Great Reformed Church of Debrecen, the iconic church building of the city and the Reformed College of Debrecen, the almost 500-year-old educational institution, have been the city's primary tourist attractions for decades. A qualitative approach was also employed to explore the perspectives of tourism professionals concerning the possible ways of interpretation of the church heritage, as well as the opportunities and challenges of the new interpretation methods. The primary data collection was carried out by means of on-site observations and 7 in-depth semi-structured interviews with a tourism stakeholders (a museum manager, guides of the exhibitions, museum pedagogy experts) of the Reformed Church and the Reformed College. Based on the observations, the offer of the religious tourism attractions included in the research was compared from different perspectives. The exhibitions and tourist spaces located in church-owned buildings were evaluated on the basis of the interpretative methods and tools used. The main criteria of our analysis were the use of digital and multimedia tools for presentation, innovative services based on ecclesiastical heritage values and interactivity, as illustrated by the information, descriptions, images and other information available on the websites of the sites studied.

The seven in-depth interviews were based on an interview protocol and a set of specific topics and questions. As for the participants' background information, 3 interviewees were males and 4 were females. Two of them work as tourism experts at the administrative offices of the Reformed Church in Debrecen, one as a museum manager, two as tour guides and three as museum pedagogy experts. All of the respondents have at least five years of work experience in tourism. The interviews were held between November 2024 and February, 2025 at the chosen religious sites. The interviewees were informed about the aim of the research and they were assured that their anonymity is protected. Saturation was reached when responses were repetitive and new perspectives did not appear. A thematic analysis was implemented after the interviews, following the six steps of thematic analysis procedures by Braun and Clarke (2006).

4. Results

Debrecen, Hungary's second biggest city, often mentioned as the "Calvinist Rome", has a unique product offering, a significant part of which is its ecclesiastical heritage. It is crucial for the city's competitiveness in terms of tourism that buildings of historical, religious and monumental value are also attractive and interesting for tourists.

4.1 Tourism interpretation methods at the Great Reformed Church and the Reformed College

The Reformed Great Church of Debrecen is the iconic building of the city and the symbol of the Reformed Church in Hungary (Mátyás, 2020). Visitors can explore the building on their own or on guided tours, and take part in thematic museum education sessions, during which they can learn about the life of the Reformed in Debrecen from the 17th century to the present day. They can also visit several exhibitions presenting biblical stories and modern art. During the visit, the building can be explored through nine

stations. First, visitors will find various objects (e.g. the Governor Lajos Kossuth's former chair, an original Bible from the Middle Age, etc.) and related texts, both longer and shorter, which will help them to find out more detailed information. QR codes can also be found next to each object, which help visitors to receive further information on the exhibited objects. Moving through the exhibits, there are mock-ups of several significant Bible sites, which take visitors all the way to Debrecen, so they can get a closer look at the church from a church history perspective. The last stop on the tour is a chance to see the view of Debrecen from the towers, and the guided tours include a glass of wine, which may be consumed at the top of the church.

Although digital technologies are used in the presentation, but more important are the written texts that visitors can read on the information panels. Visitors can learn about the heritage values of the Great Church through interactive museum education and museum andragogy activities on various themes, including putting on costumes, short drama plays (Lajos Kossuth, Hungary's governor in 1849 reading the Declaration of Independence), quizzes, puzzles and other playful activities (Figure 1). These activities are led by museum professionals, who work full time for the church and are committed to co-create the experience with the visitors during the tours. The employees who were interviewed in our research claimed that personal relations are much more appealing to the adults and the senior visitors, who are reluctant to read QR codes and digital displays. The majority of the respondents felt that the sacred nature of the sites may urge people to avoid the use of technical devices and visitors prefer human contact to digital information.

The Reformed College of Debrecen, which has been in continuous operation since 1538, and it plays an important role in the life of the city as an educational and cultural institution. Its historical significance is due to the fact that in 1849 the Hungarian Parliament met here and the Declaration of Independence declaring the dethronement of the Habsburgs was prepared here. The museum also houses several permanent exhibitions. There is an exhibition on the history and traditions of the Reformed Church (Church History Exhibition), and on the famous students and teachers of the College and the historical traditions of the school (School History Exhibition). As in the Great Church, the exhibitions are complemented by information panels placed next to them. However, in addition to the static interpretation, there will be several interactive sessions to take part in the various experiential elements of the exhibition. Visitors can try out a period printing press, lift the students' ancient fire-fighting tool, the gerundium, and sit on the benches of a college classroom. They can also watch a short-animated video about student life in a dormitory and listen to interesting stories, sermons and poems through headphones.

Primary and secondary school students can enjoy museum activities and interactive adventure games, while adults can take part in guided visits, with a special emphasis on storytelling related to the exhibits, and learn about the story of the discovery of the Kaba meteorite, the everyday life of the students of the College. We found that the exhibition in the College has more interactive elements than in the Great Church, and uses a wider range of digital technologies, but again the presentation is mostly based on the written text.

The Szabó Magda Memorial House is a branch of the Debrecen Reformed College Museum, and it is dedicated to the life and works of the writer, Magda Szabó. Although it is not specifically a church historical monument, it is connected to the Reformed

church life in many ways. The memorial site invites visitors to an imaginary world, furnished with original bequests or period objects, and presents the typical places of the writer's life, the scenes of family life. The interiors bring to life the everyday life of the family, reconstructing the writer's former home on the basis of her autobiographical writings. The objects placed here come to life along with the texts that can be read next to them. In addition, the public spaces of the city and the most important stages of the writer's life in Debrecen are also shown. The fiction is presented through objects from the novels (e.g. a reconstruction of a dress and other props from the film *Abigél*). Virtual travel in space and time is given a prominent role, with a number of creative elements added to the exhibition to create a sense of time travel. Touchscreen installation (with images and text) is displayed to evoke the historical past. Digital tools are also used in the presentation. A virtual family tree of the author is displayed, but QR codes and touch screen installations are also displayed. A documentary film on the life of Magda Szabó can be seen in one of the rooms. The human voice also features in the exhibition, with the writer's voice coming from the handset of an old telephone. One of the exhibition's strengths is that visitors can touch and hold the objects on display (books that can be turned over, drawers that can be pulled out, a movable installation of urban sculptures). For kindergarten and primary school children, museum educational activities and interactive games are organized, based on a story by the author, while secondary school children can participate in museum lessons, and adult visitors can enjoy various museum events (e.g. Museum Night programmes, literary evenings, readings, etc.) and guided tours. Overall, although the exhibition relies in part on digital technologies and interactivity, they are not the main focus. Both in the exhibition and in the museum education sessions, it is the writer's texts, her legacy objects and family photographs that provide the best means of connecting with what is on display.

Table 1: Summary of the tourist offer of the investigated attractions

	<i>Great Reformed Church</i>	<i>Reformed College</i>	<i>Szabó Magda Memorial House</i>
<i>Digital tools</i>	<i>QR-codes, films</i>	<i>QR-codes, short videos</i>	<i>QR-codes, virtual family trees, touchscreens, documentaries</i>
<i>Multisensoral experiences</i>	<i>–</i>	<i>stories can be listened to from headsets</i>	<i>voice of the writer can be heard from an old telephone</i>
<i>Interactive elements</i>	<i>touchable replica books, roleplay games, quizzes, putting on costumes</i>	<i>old classroom, which can be tested, movable objects (drawers, printing machines, etc.)</i>	<i>movable installations, books</i>
<i>Museum pedagogy programmes</i>	<i>for preschoolers, students, adults</i>	<i>for preschoolers, students, adults</i>	<i>for preschoolers, students, adults</i>

Source: Authors' own compilation, 2025

The interpretation methods used at the investigated sites were compared according to four criteria, as illustrated in Table 1.

4.2 Opportunities and challenges for employing the new approaches to interpretation

The need for tourism development at the ecclesiastical heritage

The interviewees highlighted that it had been recognized for many years that there is a need for visitor-friendly developments that respect the heritage value and the uninterrupted exercise of religious life. As one tourism expert explained „*We wouldn't like to see our churches standing empty and deserted or converted into secular buildings. But as many congregation members prefer online services, we fear that the buildings become out of use in the future*”.

The Reformed Church has recently launched a large-scale tourism programme focusing on built heritage sites (mainly churches), as there are numerous memorial sites, museums and public collections in the region. The aim of the programme, entitled "Religio et Patria - Freedom, Creed, Creation", is to present the ecclesiastical heritage to secular visitors and to integrate it into the tourist offer of the city and the region. The museum managers and the tourism experts of the church agreed that churches have been given new functions as cultural centers offering classical and modern concerts and performances.

Cooperation among tourism and church stakeholders

The museum manager emphasized that the ecclesiastical attractions are part of a single brand, which makes cooperation among the attractions and the tourism professionals of the city inevitable. In order to be competitive, it is necessary to develop a visitor-friendly environment, to have some kind of revenue-generating activity (e.g. admission fees, programme organization). In the museum manager's view, as a result of the cooperation heritage tourism development has brought the quality of the offer to the point where attractions and related services can be sold as a competitive tourism product. The greatest strength of the cooperation is that it makes the ecclesiastical heritage available to the public, and integrates the built and spiritual heritage of Debrecen and its surrounding region into a complex tourism product. A common ticket system was developed under the title "Debrecen is the city of the Reformation", which entitles visitors to enter the Reformed College Museum and the Reformed churches within 2 days. This scheme enables the attractions to be promoted simultaneously and encourages visitors to visit all of them during their stay. The tourism experts pointed out that as a result of the tourism programme implemented in 2024, around 50,000 visitors visited the Reformed churches and exhibition sites in Debrecen and the surrounding area, in addition to those attending congregational and liturgical events.

New ways of interpretation

The tour guide and museum pedagogy experts highlighted that interpretation of ecclesiastical sites can take many forms, but the basic requirement is to present the values with historical and ecclesiastical authenticity. The presentation of built heritage provides an opportunity for encounter with a church and religious communities, while culture brings visitors closer to Christian faith and ideals and makes ecclesiastical values of high artistic and aesthetic quality widely accessible. The cultural programmes also aim to appeal to the younger generation.

Religious tourism is also a kind of missionary activity for the historic churches, as they can bring the message of the churches closer to the people through their historical, cultural and theological heritage. The ultimate goal of religious tourism is not to attract more tourists, but to reveal the church's heritage through quality tourism services and attractions.

The findings suggest that introducing technologically innovative solutions in interpretation may be necessary to grab the attention of the younger generations. As one of the museum pedagogy experts pointed out "Everybody *has their mobile phones in their hands all the time. We need to use those mobiles for edutainment, otherwise they just take selfies even in the church*".

Major challenges in the tourism development of the ecclesiastical heritage

The interviewees repeatedly emphasized their concern over the shortage of human resources. Several forms of interpretation, e.g. storytelling, personal presentations, museum pedagogy programmes and assistance with the digital tools require well-qualified professionals. For example, one respondent mentioned: "We do not have enough staff at the peak season, especially during the school trips' season." One respondent affirmed: "Then we never have enough time to exchange ideas with each other."

The lack of financial resources is the other major problem highlighted by the interviewees. Technological tools are still considered a new innovation with huge potential, however purchasing and implementing the modern, interactive digital tools in the tourism interpretation process requires a constant flow of funding, otherwise they become outdated very quickly. The long-term maintenance of digital tools required considerable funding, which is clearly recognized by the interviewees.

5. Conclusions

In our study, we sought to answer the question of how the Reformed Church uses methods and tools to present the religious tourism attractions it owns to visitors, and how it interprets the values of the cultural heritage of the Church to non-denominational tourists with a primarily cultural motivation. Based on field participant observations, in-depth interviews with experts and content analysis of the websites of the attractions studied, it was concluded that the tourism programme of the Tiszántúli Református Church District, Religio et Patria, and the religious tourism attractions of Debrecen offer a complex tourism experience diversified according to demand needs. In the case of churches, such as the Reformed Church of Debrecen, increased care must be taken when implementing tourism developments to ensure that the primary religious functions of sacred places of worship are not compromised and that members of faith communities who wish to practice their faith are not disadvantaged by the service provided to tourists. In contrast to many examples in Western Europe, where Christian churches have become empty, abandoned buildings, sometimes catering and event venues, the vast majority of churches in Hungary still function as active places of congregational life. The Great Church and the Reformed College are also national monuments because of their historical significance, so the spirit and dignity of the place must be respected in the activities that take place there.

We have found that the former interpretation based on one-way communication, the factual presentation of exhibited objects and the static means of presentation are

increasingly being replaced and complemented by storytelling. The stories conveyed are varied and do not only cover the themes of religion and faith, but also recall, among other things, the history of the school (everyday life in the Reformed College), the lives of prominent figures and the history of the school (the life of the Reformed College).), and linguistic curiosities (biblical sayings in the Great Church, the etymology of "gerund" in the College, excerpts from Magda Szabó's works in the Memorial House, etc.).

A novel way of meeting the needs of visitors to religious institutions is to integrate gastronomic and musical experiences into the complex tourist experience. A good example of this is the "Big Church in Love" programme, where, after a short organ concert, visitors can taste the wine of the Big Church while admiring the sunset on the panoramic walkway in the church's nave. A café-bookshop is also located in the Memorial Garden between the Great Church and the Reformed College, which also contributes to visitor satisfaction. In all three sites studied, great emphasis is placed on the introduction of interactive interpretation, with playful exercises and puzzles to make the thematic sessions more interesting for all ages.

Movable, touchable objects during the self-guided tours help visitors to become active participants in the exhibitions, not just spectators. Moving somewhat away from current trends, the use of digital tools (e.g. holographic projections, multimedia and VR tools) was also found to be relatively limited in the presentation of the ecclesiastical heritage. In our opinion, it would be worth considering a wider use of digital technologies, as the introduction of modern visual communication techniques can bring a number of benefits. On the one hand, they can be an effective complement to interpretation methods and, on the other hand, they can be used to stimulate the interest of younger generations.

It can be concluded that the key to the survival of heritage attractions is to incorporate modern innovations into museum practice, while respecting and complementing the heritage value. In the case of religious tourism, respect for sacred space is of paramount importance, and the tourism function must not in any way infringe on the primary site of religious practice. However, the sites mentioned in the study are examples of how the built heritage can be successfully transformed into an attraction promoting the historical and spiritual values of the church through the development of a tourism product based on a well-thought-out marketing concept.

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SPECTACLE OVER SUBSTANCE: THE DIGITAL APPROACH OF DARK TOURISM

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Abstract: *In nowadays digital era, sites of trauma, death, disasters and collective mourning are highly mediated through online platform designed for entertainment and visibility, all empowered by algorithms. The purpose of this paper is to have a closer and critical look on how dark heritage adjusts itself in contemporary tourism, where locations of historical tragedies are repacked into a visual spectacle, all consumed through social media. Algorithms of social media platforms, such as TikTok and Instagram, advantage the shocking values and the dark aesthetics over historical fact and empathy. These platforms favor a higher risk of trivializing trauma and disaster, the whole concept of dark tourism, because of how it's presented in online space. The dark heritage tourism in the digital ages is increasingly subjected to the processes of commodification and cultural detachment, whereby memory becomes a visual thing circulated for affective impact, rather than for a historical reflection. A superficial engagement and the virality of short videos shared online are helping into shaping the behavior of the tourists visiting dark heritage sites. Lastly, this paper holds a critical assessment on how dark tourism is presented in social media and proposes few strategies for educating the tourist of dark heritage sites. In addition, the paper takes the discussion further by exploring the educational role of dark tourism and considering how the aestheticization of trauma shapes public memory. It also suggests ethical and sustainable ways to engage with dark heritage in digital spaces.*

Keywords: *dark heritage, social media algorithm, dark tourism*

JEL classification: Z32

1. Introduction

As stated in previous papers regarding this matter, it's well known that dark tourism involves traveling to places that have encountered, or are associated with death, disaster, depravity, misfortune, and the macabre as Lennon and Foley (1999) defined it. The "dark tourism" term was first defined by Foley and Lennon (1996b) as a "tourist interested in recent death, disaster and atrocity" borne of a "fundamental shift in a way in which death, disaster and atrocity are being handled by those who offer associated tourism products". However, they were not the first to refer to death related destinations. Rojek (1993) called this concept of visiting death related site as "black-spots", or "the commercial developments of grave sites and sites in which celebrities or large numbers of people have met with sudden and violent death". Later, Philip Stone (2006) introduced the concept "spectrum of darkness", expressing the idea that not all dark tourism destinations have the same spectrum of "darkness", some are darker (like Auschwitz – a place where horrid atrocities took place), some can be presented in a

grey light (a random museum of Holocaust that it's not closer to the place where the atrocities took place).

Dark tourism creates a unique, yet controversial concept as it offers an uncommon feeling and atmosphere that are grief, sadness and guilt in contrast to other kind of tourist sites (beaches, mountains, metropolitan, etc.) which presents joyful feelings.

Thus, dark tourism is melding memory, history, culture and economics, raising some essential questions about how we choose to remember, learn and transform pain into an object of visitation.

Very closely related to this phenomenon is the term dark heritage, which refers to those elements of cultural heritage that carry the memory of traumatic and uncomfortable events. These spaces (that can be physical or virtual visited) become sensitive meeting points between memory and identity. In addition, the educational role of dark tourism has gained a growing attention in recent years. Dark heritage sites give visitors meaningful opportunities to learn about history, reflect on ethical issues, and develop empathy. By engaging with stories of suffering and resilience, visitors can better understand the dynamics of violence, intolerance, and collective trauma. Museums, memorial centers, and guided interpretation programs help situate these events within their historical context, ensuring that trauma is not reduced to simple spectacle. In this way, dark tourism can serve as a valuable teaching tool, fostering both emotional connection and critical thinking. Building on this perspective, the goal of this paper is to examine how digital platforms are reshaping the way dark heritage is perceived, consumed, and understood. By looking at the influence of algorithms, online visual culture, and user-generated content, the study explores the tension between visibility and sensitivity, between remembrance and entertainment. The following sections pursue this line of inquiry by analyzing how digital mediation transforms the role of dark heritage in contemporary tourism and by identifying ethical, sustainable strategies that can help preserve its educational value.

2. Literature review

The literature on dark tourism explores its psychological, ethical, and cultural dimensions. Seaton (1996) framed it as "thanatourism," where visitors seek confrontation with death as a form of existential reflection. Lennon and Foley (2000) emphasized that dark tourism reflects postmodern anxieties and global media fascination with tragedy. Scholars such as Hartmann (2014) and Light (2017) have noted its uneasy relationship with heritage management, arguing that dark sites often oscillate between commemoration and commercialization. Recent studies have expanded this discussion to the digital sphere. Bolan and Simone-Charteris (2018) explored how online media can enhance the dark tourism experience, while Sharma (2024) examined the intersection of digital culture and dark tourism. Together, these studies suggest that digital mediation both democratizes and distorts engagement with dark heritage. In nowadays digital era, sites of trauma, death, disasters and collective mourning are highly mediated through online platform designed for entertainment and visibility, all empowered by algorithms. When it comes to dark heritage sites, the social media platform helps in transforming these places with a huge tragic weight in a different scenery, all to get more likes, shares and visibility. Every influencer is searching for a different and innovative way to demonstrate their presence on the places where others perished, as Hodalska (2017) stated. At this point, we can talk about commercialization

of pain through social media platforms, capitalizing grief and suffering through online storytelling and technology. Although Holdaska (2017) talk about the motivation for some of the tourist visiting dark heritage sites, that they present the same pattern in being “digital narcissist” with the need to collect memories to come back in touch with their feelings.

The dark heritage tourism in the digital ages increasingly subjected to the processes of commodification and cultural detachment, whereby memory becomes a visual thing circulated for affective impact, rather than for a historical reflection. A superficial engagement and the virality of short videos (reels) shared online are shaping the behavior of the tourists visiting dark heritage sites. In an era where the “like, share and follow” buttons are the new instruments used by the public to reach the history, it can be said that “clicking” is becoming synonymous with “remembering”. A selfie from Auschwitz or Chernobyl can be perceived as empathy but can also trivialize the deep meaning of that dark heritage site. The algorithm-driven logic of digital platforms amplifies these trends. Because algorithms favor content that generates the most engagement, they tend to push forward shocking, aestheticized, or sensational images of dark heritage. Strong emotional reactions, whether sadness, fascination, or fear, are rewarded with greater visibility. In turn, users feel encouraged to produce striking visuals instead of engaging in meaningful reflection. This creates a feedback loop in which sites marked by trauma risk becoming stages for digital self-performance. The idea of ‘affective publics’ (Papacharissi, 2015) is particularly useful here: online communities form around emotionally charged images rather than historical understanding. Shared feelings, not factual knowledge, drive engagement, shifting dark heritage from a space of learning to one of emotional consumption. Digital tourism also shapes what researchers call ‘mediated presence.’ In this mode, physically being at a site becomes less important than capturing and sharing that moment online. As documenting replaces experiencing, the reflective dimension of dark tourism gives way to performances crafted for algorithmic visibility.

Finally, online exposure often leads to selective memory. Users encounter fragmented, decontextualized versions of the past, not curated by historians or educators, but filtered through platform algorithms. As a result, tragedy risks becoming a visual commodity, and remembrance is reduced to an aesthetic gesture.

Overall, the literature suggests that dark tourism is undergoing a digital turn, one that requires careful analysis of how trauma is mediated, commodified, or educationally enriched in online spaces.

3. Methodology

This article adopts a qualitative and critical approach, analyzing digital representations of dark heritage across social media platforms such as Instagram, TikTok, and YouTube. The research methodology is based on critical discourse analysis and media semiotics, aimed at understanding how algorithmic structures influence emotional engagement and educational outcomes. A theoretical review of old and contemporary works was conducted to map the evolution of dark tourism research, with emphasis on digital mediation, affect theory, and memory studies. Academic sources include peer-reviewed articles, books, and recent analyses of online behavior. Sources include peer-reviewed literature on dark tourism, social media studies, and digital ethics. This analysis focuses on:

- visual aesthetics used in dark tourism posts,
- language patterns emphasizing shock, aestheticism, or emotional display,
- algorithmic amplification mechanisms,
- ethical issues emerging from content circulation.

The purpose of this paper is to have a closer and critical look on how dark heritage adjusts itself in contemporary tourism, where locations of historical tragedies are repacked into a visual spectacle, all consumed through social media. Algorithms of social media platforms, such as TikTok and Instagram, advantage the shocking values and the dark aesthetics over historical fact and empathy. The digital content trends were compared with official museum narratives, educational guidelines, and curatorial frameworks of internationally recognized dark heritage sites. This comparison highlights discrepancies between historically accurate representations and algorithmically rewarded content. The study does not collect or analyze private data. It relies on public, widely visible trends, hashtags were followed in online.

4. Results and discussion: Digital platforms and the aestheticization of trauma

Digital platforms have transformed the ways in which dark heritage sites are perceived and consumed. Algorithms reward engagement-driven content, privileging emotion, spectacle, and aesthetic appeal over factual accuracy and moral sensitivity. Sontag (2003) and Hirsch (2012) caution that such visual consumption risks turning historical suffering into commodified emotion. This dynamic reconfigures collective memory, making it algorithmically curated rather than historically grounded. Before the digital era, the visual representation of worldwide tragedies, dark tourism sites and grief representations were managed by institutions such as museums, or they were presented in documentaries and history books, all of which tried to maintain a certain rigor and solemnity (Lennon & Foley, 2000). Building on Citton (2017), the results show that algorithmic systems play a major role in shaping collective memory:

- users are exposed to curated fragments of history,
- viral sounds and trends overshadow historical information,
- emotional intensity becomes more important than factual accuracy.

Nowadays representation of dark heritage sites is also shaped by visual social media platforms, platforms where anybody can create a dark and aestheticized grief content and the accent is not on the historical facts or empathy, the algorithms are showing the “shock”, the emotion and it’s just a visual representation (Sontag, 2003). The problem in this matter arises, in my opinion, when algorithms “decide” what kind of content the users are seeing (Citton, 2017). What kind of “memory” is collectively building when the algorithms show just one side of “the story”? Although the digital aestheticization of trauma is not a negative act, it can also function as a gateway to knowledge and empathy, it’s difficult to maintain solemnity and a certain rigor.

In the absence of a responsible approach, collective memory can be distorted, exploited or abused. One of the biggest risks is trivializing history by transforming it into attractive visual content, but it’s a content emptied of its deep and painful meaning. The result of

this trivializing is that trauma is aestheticized, and historical complexity is sacrificed for visibility (Sontag, 2003; Hirsch, 2012). Institutional narratives emphasize:

- contextualization,
- survivor testimony,
- critical reflection,
- historical accuracy.

In contrast, algorithm-driven content prioritizes:

- spectacle,
- emotional reaction,
- short attention spans,
- visually iconic motifs.

Thus, digital mediation often undermines the educational mission of dark heritage sites. Another risk is the unethical commercialization of the trauma, when platforms and its users can capitalize the interest in dark heritage to sell experiences, products, or services that turn tragedy into spectacle. VR tours, thematic filters, memorial-themed, or sponsored content related to genocide can reach sensitive limits of memory exploitation. The grief and trauma are reduced to an easy emotion and a background. An alternative to online hysteria is slow tourism. Slow tourism is defined as spending more time in a certain place, with the priority of personal reflection and understanding the deep cultural meaning of the visited place (Fullagar, Markwell et Wilson, 2012). This kind of tourism holds strong relations with the local community and reduces the social impact of traveling on the environment (idem). One of the biggest benefits of slow tourism on dark heritage sites is that this form of tourism is combating trivialization of historical meaning and grief in online platforms and it's creating a stronger and ethical bond between tourist, local communities and dark heritage spots. In a world where dark heritage risks are becoming just an aesthetic emotional Instagram post, slow tourism is offering a sustainable and ethical strategy. At the same time, digital technologies can be used in meaningful ways when they are guided by ethical principles. Curated digital archives, contextual mobile apps, and narrative-based AR experiences can foster deeper understanding rather than superficial engagement. Instead of amplifying shock value, these tools can offer layered explanations, survivor testimonies, and interactive timelines that help visitors navigate complex histories. *Digital literacy also plays a crucial role.* Teaching users how algorithms work, how to photograph sensitive sites responsibly, and how to share memories ethically can influence how they behave online. When tourists approach dark heritage with greater critical awareness, social media can shift from being a space of spectacle to a space of thoughtful, mediated learning. Equally important is giving local communities a voice in shaping digital representations. Their perspectives are often overshadowed in global digital narratives. Involving them in the curation process can ensure that online portrayals of traumatic histories are more accurate, respectful, and rooted in local cultural contexts. Despite risks, digital spaces can also:

- democratize access,
- preserve survivor testimonies,
- support educational projects,
- engage younger audiences responsibly.

Another alternative is involving circular economy in dark heritages sites. Circular economy helps to rethink how resources, materials, symbolic and digital – are produced, consumed and reused.

5. Conclusions

Digitalizing the dark tourism, dark heritage sites involve a tension between visibility and sensitivity. The key question is not whether to digitize trauma, but how to do so without reducing it to spectacle, commodification, or aesthetic consumption. The responsibility lies with all the actors involved: platforms, creators, cultural institutions, and the public, to build a digital culture of memory that respects suffering and grief, the survivors and their families, preserves the meaning of the sites and invites them to reflection, not just reaction. This paper has shown that digital platforms reshape dark heritage by favoring visibility over depth, emotion over context, and spectacle over substance. Even so, dark tourism still holds strong educational potential—especially when supported by ethical mediation, thoughtful contextualization, and responsible digital practices. By bringing together slow tourism principles, digital literacy, curated archives, and the active participation of local communities, the reflective and educational value of dark heritage can be revitalized in the digital era. Looking ahead, interdisciplinary approaches will be essential to balancing technological innovation with ethical remembrance, ensuring that traumatic histories are not just seen, but genuinely understood.

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SECTION INTERNATIONAL BUSINESS, EUROPEAN INTEGRATION, FOREIGN LANGUAGES AND BUSINESS ENVIRONMENT

ACTIVE READING IN FOREIGN LANGUAGES AS PART OF AUTONOMOUS LEARNING WITH NEW LANGUAGE LEARNING TOOLS

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Abstract: *In today's fast changing world, in which information travels at an unprecedented speed, going beyond one's mother tongue to obtain up-to-date information about current economic, political, cultural, scientific or military issues has become almost routine for a considerable number of people. This process of continuous information and self-instruction is based on active reading. The emergence of AI tools that translate instantly and accurately from almost all foreign languages into any target language is an undeniable help, but also a threat to the individual's wish to invest effort in learning. AI tools such as ChatGPT have seen a remarkable increase, but other tools, known to a much lesser extent, offer comparable benefits, being readily applicable. This is the case of add-ons, which are tools designed to improve not only safety, but also web browsing functionalities. In the field of communication, there are several add-ons that provide language support for translation, correction, processing and improvement of texts in any foreign language. The present article aims to show how people can use the facilities of add-ons in the field of foreign languages intelligently, so that they remain in a state of active engagement and do not completely abandon themselves to technology, disregarding personal effort and critical thinking. Active reading with add-ons, necessarily associated with post-reading actions, allows individuals to retain authority over their own learning and control over the progress they make autonomously in one or more foreign languages.*

Keywords: *active learning, add-ons, Artificial Intelligence, self-instruction, foreign languages, autonomous learning*

JEL Classification: D83, Z19.

1. Introduction

The emergence and development of AI have already created the impression that learning foreign languages will no longer be necessary. Major players in the AI market warn that AI will soon replace teachers, because it is presumably a better teacher than humans are, always able to customize learning and improve learning outcomes (Ivanova, 2025). We can assume this overarching prediction includes the field of foreign language teaching, too.

The loss of children's, young people's, and adults' ability to read in their mother tongue has been a widely researched topic of discussion even before the advent of AI. Reading in foreign languages is a niche activity of additional complexity, reserved to those who not only have the pleasure, motivation, and/ or ability to read regularly, but also have a sufficiently advanced command of foreign languages to perform this activity.

With the development of technology, one can talk about the democratization of the access to information in any foreign languages (Messias *et al.*, 2023). From the limited access to a few internationally spoken languages, humanity has now reached a point where texts written in almost any language of the world are within virtual reach, and time and space limitations are removed.

At a time when attention has shifted entirely to AI, there is a preoccupation for finding ways to keep users connected to their learning and retain authority over it, without abandoning themselves to AI or completely delegating control and personal authority (Constantin, 2024a). The present article aims to highlight that reading texts in foreign languages on the internet can be done constructively and that an add-on tool can keep the user committed to learning using AI, in a state of engagement with respect to the practice of active and regular reading in foreign languages.

Thus, the study represents an attempt to restore the importance of ordinary regular reading (Canvat, 2007) in the context of receptive activities of texts written in foreign languages with the help of new technologies. In this respect, we support Passeron's view that "Whatever the text read, whatever the reading conditions, whatever the reason for reading, anything that helps those who read the least to read a little more is good" (Passeron, 1993, apud Canvat, 2007). Language support add-ons accelerate this reading, and, in the context of active reading undertaken by autonomous users, they enable progress in foreign language development.

2. Regular active reading

Most studies on reading address the topic of reading literary texts from didactic, sociolinguistic, or psycholinguistic perspectives. Bemporad (2014) attempted to reconceptualize the modes and types of literary reading, showing that it must be approached in light of dichotomies that consider both the social context and the individual purpose. This outlines the distinction between free voluntary and compulsory reading (Singly de, 1993), between regular and scholarly reading (Canvat, 2007), or between leisure reading and professional reading, constrained by external requirements (David, 2012).

This distinction can easily be transferred to the reading of non-literary texts: general or specialized press, testimonials on travel websites, medical aesthetics or dentistry clinics, museum presentations.

The present article puts emphasis on private, regular, and selective reading, sometimes done in fits and starts, with a purely personal purpose, not imposed from the outside, i.e., reading for pleasure done autonomously (CEFRL, 2001: 45). Given that specialists are concerned about the disappearance of people's interest in reading, this personal reading in informal settings should not be underestimated. It should be regarded as an excellent opportunity to develop the very skills which the lack of literary, academic, or professional reading would hinder: perceptual skills, memory, decoding skills,

inferencing, predicting, imagining, referring back and forth, or rapid scanning (CEFRL, *idem*: 92).

If literary reading in a multilingual environment represents a path to language acquisition (Bemporad, 2014), we could hypothesize that the habit of reading texts, albeit short, regularly, systematically, and autonomously could develop a series of skills related to reading, such as identifying different genres, understanding texts as linguistic entities, understanding and interpreting messages in context (CEFRL, *idem*: 91). This repeated, cultivated, conscious contact with accessible texts in foreign languages is also acknowledged to enhance proficiency in the target language, as well as active reflection on crosslinguistic correspondences (Simard, 2007).

There are several post-reading actions that the reader can perform to foster language learning: taking notes, writing a text based on the reading, follow-up discussions, working on grammar, working on vocabulary, increasing reading speed etc.

Given that the last two decades have seen a paramount change in news consumption patterns, with people using more and more sources of information via the internet, online reading has become "the essential new literacy skill", built through the frequent use of learning strategies (Cheng, 2016; Watson, 2025). All these learning strategies would be obliterated if readers chose not to actually read a text, but to systematically activate the version automatically translated by translation engines or AI.

3. Autonomous readers in foreign languages

For a better understanding of our analysis, it is necessary to distinguish between two categories of readers:

a). Readers whose language skills are not strong enough to decode the written message and who want immediate benefits, obtained as easily as possible. Given their limited linguistic profile, they would be deprived of any information conveyed by means of foreign languages unless they resorted to tools that facilitate text comprehension. Considering modern tools, one can assume that these readers would rely precisely on the full translation of texts into their native language, which gives the tools a strictly utilitarian role, that of understanding. This purely "troubleshooting" reading level is devoid of any formative role.

b). Readers who are aware of the importance of continuous foreign language learning, in authentic situations, who have a plurilingual profile and are motivated to improve it. These are metacognitive learners (Salehi & Bolandifar, 2025), most of them multilingual, but who may ignore their linguistic potential (Béacco & Byram, 2007). They are eager to improve their foreign language skills, to learn a less familiar language and to apply advanced comprehension and intercomprehension techniques which help them understand a text in a foreign language. For conscious multilingual users who read constantly articles in foreign languages, add-ons combine a strictly utilitarian role with a formative one.

People read in a foreign language because they have a purpose to achieve, such as extracting specific information, extracting detailed information, or getting the general picture of the text (Harmer, 1991; Cabuyao & Velasco, 2025). All this supposes global reading, but the processing is always performed in accordance with the objective envisaged by the reader and entails the use of different sub-skills (Vizental, 2008: 155). Reading sub-skills are mostly subconscious in one's mother tongue, being shaped by

education, training and occupation, but they need to be developed and reactivated in a foreign language, which supposes an active participation on the part of the reader (Harmer, 1991). Such sub-skills are the scanning of the text, when readers know exactly what kind of information they want to find and broadly disregard the other information and the unknown language, reading for detailed understanding, which is mainly concerned with what can be grasped beyond what the author actually presents, and skimming, when the reader is interested in the main points of the text, in having an overview, without much concern to details.

The good understanding of an informative text presenting news is likely to require at least B2 level for reading, considering the descriptor in The Common European Framework of Reference for Languages (CEFR): "I can read articles and reports concerned with contemporary problems in which the writers adopt attitudes or viewpoints. I can understand contemporary articles and literary prose" (CEFR, 2001: 26). B1 level could also prove satisfactory provided texts pertain to fields the reader is familiar with and do not comprise sophisticated structures or vocabulary: "I can understand texts that consist mainly of high frequency every day or job-related language. I can understand the description of events, feelings and wishes in personal letters" (CEFR, *idem*: 26).

It can be assumed that many people interested in keeping up to date with the latest events around the world, as reflected in the international press or on news websites, do not have the foreign language proficiency levels mentioned above. It is a situation in which the poor or lack of foreign language skills may cause a divide similar to the digital one (Yaman, 2014). They are potential readers with language skills that can prevent them from correctly understanding texts, but who are unwilling to be deprived of the information provided in a foreign language.

This linguistic gap is currently bridged successfully by computer-assisted translation tools. Recent statistics regarding the use of Google Translate clearly show the extent of the online translation phenomenon. For example, it is believed that the number of words that Google Translate alone handles daily (146 billion words) exceeds the output of the work performed by professional translators worldwide over a long period of time (<https://poeditor.com/blog/translation-statistics/>). To Google Translate, which is considered the top machine translation system, we should add Azure AI Translator, Translate Me, and Rask AI, AI chatbots, and novel tools such as add-ons that use search engines, which have been less well known and used to date.

4. Access to Translations

When it comes to understanding texts written in foreign languages on the internet, today's users have several solutions at their disposal.

4.1. Using Google Translate for text fragments

Google Translate is already a classic translation tool, widely used by specialists and non-specialists in language sciences. Its main advantage is that it is free, has gained recognition in the field, and already has an established practice that has propelled it to the forefront of translation tools. Its main disadvantage is the back-and-forth between the add-on page read on the internet, from which a word or fragment is selected that has not been understood at all or not understood correctly by the reader (Fig.1). Thus,

in order to translate text fragments using Google Translate, the user has to use an intermediary page, that of Google Translate or DeepL. Only after leaving the translation engine page can the user reintegrate the translated text, so there will always be a break generated by the necessity to leave the original page.

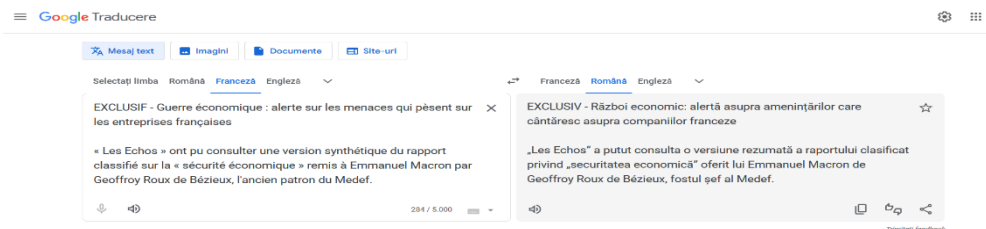


Figure 1: Fragment of the page, translated using Google Translate

4.2. Using Google Translate to translate the entire page

In order to translate the web page using Google Translate, the user has to copy the address of the web site in the source language, paste it into the left window of Google Translate and choose the target language. A new link opens in the right window, corresponding to the address introduced on the left. By clicking this link, the visitor can see an instant translation in the language he/ she wants, other than that of the original site. Thus, they can proceed with the search on this site, without the need of a manual translation. Generally, the translations are good enough to ensure an uninterrupted flow of information.

The experience is identical to browsing the website in its original version: the same design, the same information, but in the chosen foreign language. The experience is pleasant, and the visitor feels comfortable, seamlessly integrating the information in a harmonious way, even viewing dynamic elements typical of the original website, such as scrolling images or background videos. Simulations have shown that displaying information in a foreign language generally works without any problems. Translation via Google Translate is a fast and efficient way to translate and offers increasingly better translation options, despite occasional hesitations and errors. Overall, it remains an extremely useful tool, but one that is relatively underused by users.

For comparison, here is what the segmented or full-page translation of the pages presented above would look like if Google Translate were used. English and French were chosen for demonstration purposes, but any working language of Google Translate can be selected. As Figure 2 shows, errors occur in certain cases, but not in others (Fig. 2).

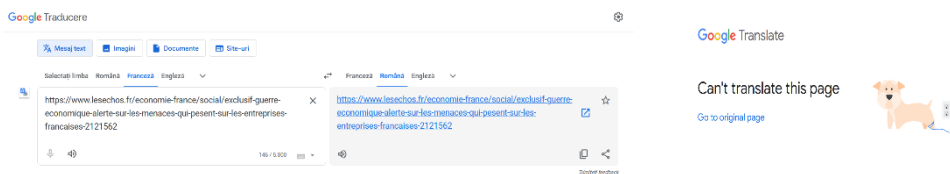


Figure 2. Step 1. Translation of the entire page using Google Translate (French website *Les Echos*). Step 2. Failure to translate the text following the link in Google Translate.

The example in English indicates an attempt to translate the entire page, which was successfully completed (Fig. 3 and Fig. 4).

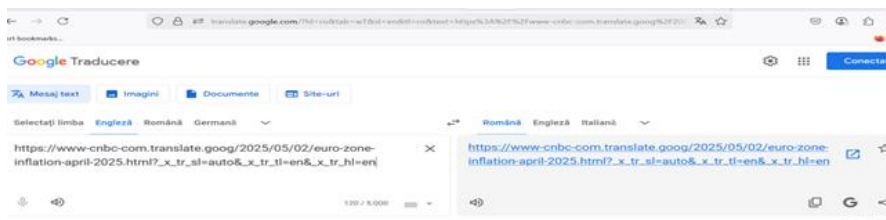


Figure 3: Step 1. Translation of the entire page using Google Translate (CNBC website in English)

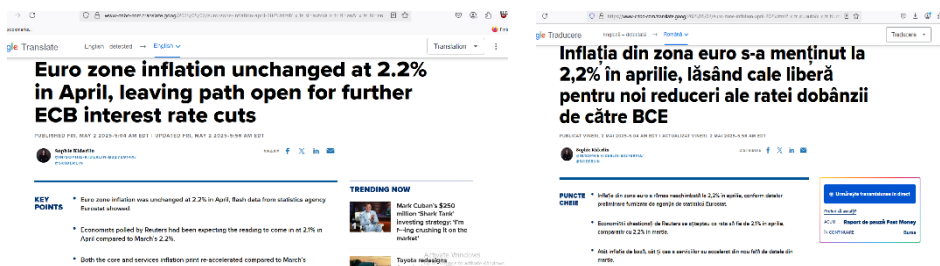


Figure 4: Step 2: translating the entire page using Google Translate (CNBC website in English)

4.3. Translator integrated into the Firefox browser (Beta version)

Integrated into the Firefox browser search bar, this translation tool is nevertheless ignored by most readers. The version available at the time of this analysis was a test version, as indicated by the Beta label.

Two surprising aspects should be remarked: on the one hand, although it is a tool integrated into the browser, it does not appear systematically on all websites: in our analysis, we could find it on the website of the French publication, but not on the English-language one (Fig. 5).

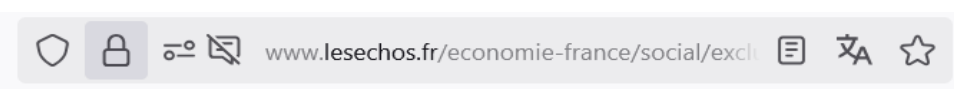




Figure 5: Presence/absence of the symbol for the translator included in the browser, depending on the website

In the case of the browser, translations improve over time. For example, an early version (May 2025) contained translation errors that could affect comprehension: *alerte sur les menaces* – *alerta amenintarilor* (literally *threat alert*); an improved version was provided a few months later (in October 2025): *alerta cu privire la amenintarile* (literally *alert concerning threats*).

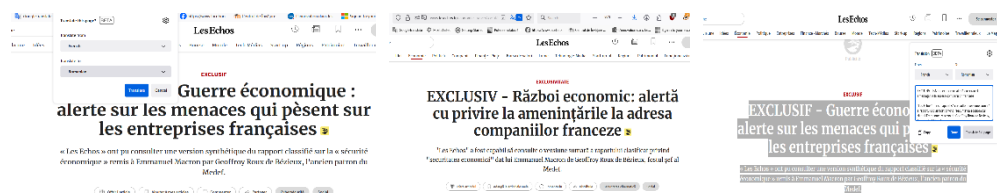


Figure 6. Translation into Romanian using the “translate this page” and “selected text” feature integrated in Browser (versions May and October 2025)

This tool translates entire pages as well as fragments of various sizes (Fig. 6).

4.4. Add-ons - the most accessible and probably the most used in the future

Add-ons are tools that have been added to web browsers (Mozilla Firefox, Chrome, Microsoft Edge) to enhance their functionality and extend their capabilities. They are connected to areas such as alerts and updates, bookmarks, news, feeds and blogging, entertainment, privacy and security, shopping, communication, and web development. In the field of foreign language communication, there are add-ons that have seen a significant increase in use and relevance in recent times and that provide language support mainly for translation, correction, reading aloud, processing, and improvement of texts in any foreign language.

The significant increase in the number of language support add-ons, by 66% in one year (from 1620 in October 2024 to 2683 in November 2025) for the Firefox search engine alone, is relevant to the interest generated by foreign language translation (<https://addons.mozilla.org/en-US/firefox/extensions/category/language-support/>).

A detailed analysis of the top 100 add-ons on Firefox with language support shows that the best known and most used are translators and dictionaries (Constantin, 2024b).

Translation add-ons offer multiple benefits. First, they can satisfy autonomous users whose language skills are enough to decode most of the written message, but who may encounter words or phrases that are new for them or whose meaning is not sufficiently clear. In this way, foreign language users rely on their existing linguistic competence and supplement it, so that for them, add-ons have both a utilitarian and a formative role. If repeated, this experience of immersion in authentic texts and the conscious discovery of new vocabulary can create the conditions for language acquisition, which is similar to the way someone learns their mother tongue (Krashen, 1982).

Then there are users who only have a basic repertoire of vocabulary, grammatical structures, and language skills (CEFRL, 2001: 112-114). These are the ones who are most likely to resort to modern tools for a complete automatic translation of the text into their native language. In this case, they immediately benefit from the extension function to understand the original text, but this time the tool has a strictly utilitarian role, as there is no learning beyond the act of translation. This scenario could be changed to something similar to the one mentioned above, assuming that the user is interested in investing some effort in learning foreign languages and considers the translated text as a starting point for post-reading activities. Therefore, the main objective of translation, namely understanding the text, should be coupled with the desire to learn or improve the target foreign language.

Add-ons offer several immediate advantages: they provide instant linguistic solutions without requiring too much effort on the part of the reader, they stimulate interest in discovering new resources (e.g., we can add the Read Aloud option), and allow contact with a large number of foreign languages. The disadvantages concern the decrease in the reader's cognitive effort (which may influence cognitive performance) and the fact that solutions are not always perfect.

5. Case study: the Simple Translate add-on

From the series of add-ons for multilingual support, we have chosen to present a specific example: Simple Translate, a widely used language support tool that is easy to install and free of charge.

5.1. Generalities

At the beginning of May 2025, the Simple Translate extension was among the best rated add-ons for language support out of all the Mozilla Firefox extensions, and the 3rd most used add-on for this search engine, after the Grammar and Spelling Checker and the French spelling dictionary. It is also available for Chrome and Edge. It is offered free of charge but its developer appreciates financial contributions for its further development. The source of the translation versions offered can be chosen by the user: either Google Translate, or DeepL. If registration is not required for the Google Translate data base, the selection of DeepL as the source of translations requires registration using an authentication key. It is very likely that the average user will not be interested in taking additional steps to access the information. But, in case a precise translation is necessary, users can switch between the two sources, so that they can compare the two versions. At the time it was analyzed for the present article, the extension comprised 31 source and target languages connected to DeepL, while Google Translate made it possible to manage translations from and into 249 languages (November 2025).

When decided to use the extension, the user has to enable the add-on, select the text to be translated (word, phrase, sentence, fragment), then the translation button pops up, the user selects the target language, and the translation is displayed directly on the same page. Alternatively, one may choose not to select any text and, after selecting the language, choose the option "Translate this page", which makes the translation of the entire page appear on a distinct page. The Toolbar popup allows users to also select the default language from which and into which translation is required, without the need for selecting the language each time. If text appears that is written in the language

initially set as the default target language, the application detects it accurately and automatically translates it into the second language that can be pre-programmed as the target language.

Although it may seem like an auxiliary element, the interface plays a crucial role in the reader's choice of the add-on from among the hundreds of competing options. In Simple Translate, the reader can configure the style of the translation panel, display position on the web page, top or bottom of selected text or clicked point (Fig. 7); font color and font size of translation result etc. (https://addons.mozilla.org/en-US/firefox/addon/simple-translate/?utm_source=addons.mozilla.org&utm_medium=referral&utm_content=search). The translation display remains on the screen even if the page is scrolled. It disappears with a simple click and reappears whenever the reader touches the symbol displayed on the page, usually at the bottom of the selected text (Fig. 7).



Figure 7. Translation from French into Romanian by selected fragments using Simple Translate. Pop-up display with the translation of selected fragment.

5.2. Simulation

In what follows, we are going to consider reading texts in a foreign language readers may be interested in for personal or professional reasons, and to whose understanding they would like to have instant access.

This part of the article exemplifies how a translation add-on can be actually used in such a situation and what its advantages are over older translation engines. We are going to show the possible applications and the benefits and drawbacks of using it, but without focusing on a specialized analysis of aspects related to the theory of translation.

The source texts we are going to use are the introductions to two articles published in French and English: "Exclusif - Guerre économique : alerte sur les menaces qui pèsent sur les entreprises françaises" from *Les Echos* (by Anne Drif, Renaud Honoré, published on the 26th Sept. 2024), and "Euro zone inflation unchanged at 2.2% in April, leaving path open for further ECB interest rate cuts" from CNBC (by [Sophie Kiderlin](#), published on the 2nd May 2025), respectively. The former is a French newspaper which requires a subscription for reading the articles in full, while the latter is an American news and business website providing articles and access to broadcasting programmes partly free of charge.

The texts selected belong to the economic field and they comprise both general and specialized vocabulary, as well as simple and more complex structures. The Simple Translate extension was first used to obtain the Romanian version of the input texts in

French, repeatedly generating an error (Fig. 8), and the Romanian version of the input text in English, respectively (Fig. 9).

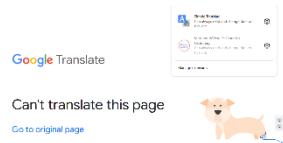


Figure 8. Translation of the entire page from English into Romanian using Simple Translate

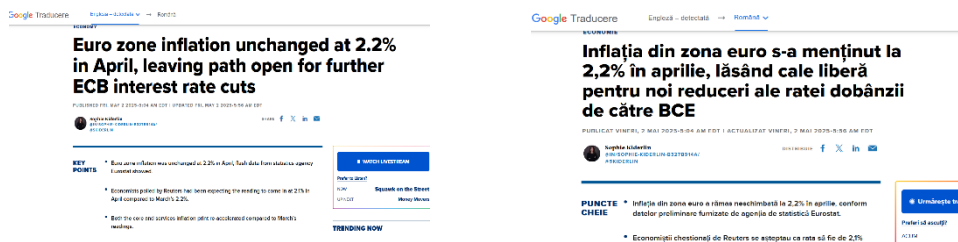


Figure 9. Translation of the entire page from English into Romanian using Simple Translate

Then the original text in English was translated into French, too (Fig.10).

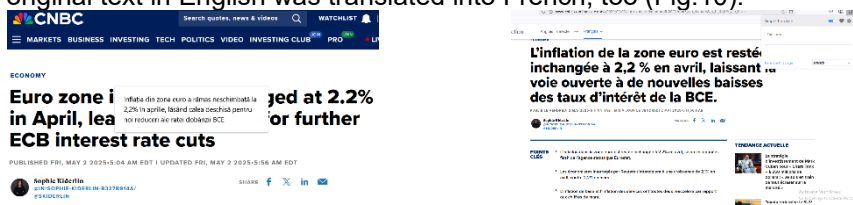


Figure 10. Translation of the entire page from English into French using Simple Translate

We first focused on the translation of the entire text displayed on the computer screen, then we considered fragments, phrases or isolated words from the input language. These are displayed in the fixed bilingual box, always located in the top right-hand corner (Figs. 11 and 12), or in the mobile box in the target language, displayed on the page. Our objective was to test the usefulness of the translation extension and evaluate the accuracy of the translation output.

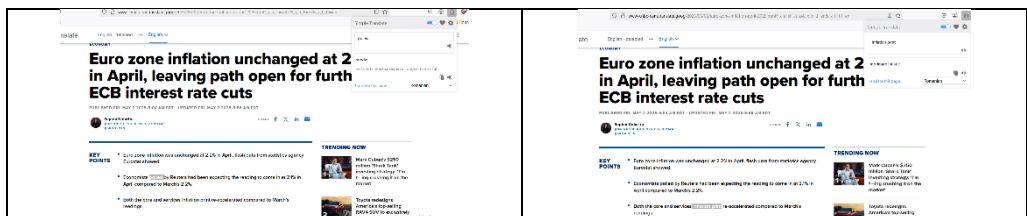


Figure 11. Translation from English into Romanian by selected words or phrases using Simple Translate

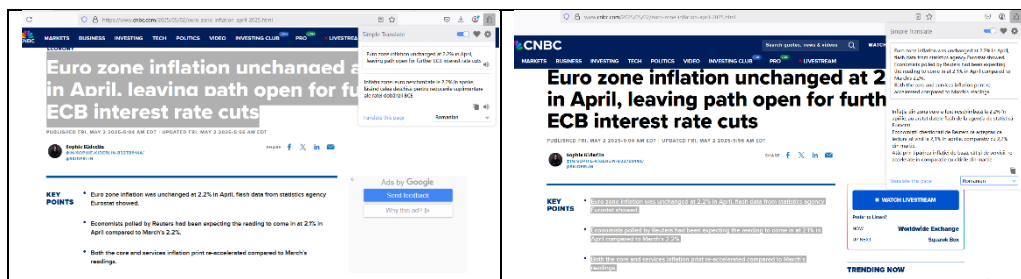


Fig. 12 Translation from English into Romanian by selected fragments using Simple Translate

Our experiment shows that the translations are not perfect, but they can offer an overall pertinent view of the texts regarding the content of the articles considered by those users who do not have a good enough command of French or English, respectively. If the user only aims at a global understanding of the text, the translated text will definitely allow him/ her access to enough information to see if it is worth reading the entire article. It can be noticed that, irrespective of the source language, there are cases in which the user will have to make a semantic adaptation effort. If the text does not contain complicated jargon, this should be done quite rapidly, as the user is aware from the very beginning that certain parts of the translation may be approximate or imprecise.

5.2.1. Source text in French

Attempts to activate the Translate entire page option in the well-known French economic journal using the Simple Translate add-on generated errors each time, even though they were made some time apart. The persistence of the error indicates a technical problem, probably related to programming. The translations were done considering fragments (Fig. 7):

- *Guerre économique : alerte sur les menaces qui pèsent sur les entreprises françaises - Război economic: alertă asupra amenințărilor care cântăresc asupra companiilor franceze.* It is clear for any speaker of Romanian that the noun „amenintari” and the verb “a cântări” do not collocate and that the verbs “apasă” or “planează” should be used. The machine activated the first meaning of the verb “peser” = “a cântări”, but its secondary meanings would be more appropriate in this context. The secondary meanings of *peser* = *a apăsa*, *a plana* would be more appropriate here.
- Two more situations in which adaptation is needed can be found in the subtitle of the same article in French. E.g., « *Les Echos* » *ont pu consulter une version synthétique du rapport classifié sur la « sécurité économique » remis à Emmanuel Macron par Geoffroy Roux de Bézieux, l'ancien patron du Medef.* - „*Les Echos*” *a putut consulta o versiune rezumată a raportului clasificat privind „securitatea economică” oferit lui Emmanuel Macron de Geoffroy Roux de Bézieux, fostul șef al Medef.* In Romanian, we would rather say “o versiune sintetică” or “o versiune rezumativă”, not “o versiune rezumată”, while a report is actually “prezentat” or “inmanat”, not “offered” to a state president.
- Sometimes the user only has queries about one isolated word, which he/ she can mark in the text. The translation offered by the machine may instantly clarify an

area of semantic opacity, but there may also be cases in which the lack of context results in confusing translations. For instance, if the user only looks for the meaning of the word “*pésent*”, he/ she receives the Romanian version “*cântărește*”.

- In the case of the word “*remis*” (*au président*) marked in isolation, the Romanian equivalent “*predat*” (*presedintelui*) is much more appropriate compared to the term “*oferit*”, provided in the initial text.



Fig. 12 Translation from French into Romanian by selected words using Simple Translate

5.2.2. Source text in English

It is interesting to notice that, when English is the source language, the translation into Romanian is flawless provided the entire page is translated at once. In this case, the machine translation could recognize complex language structures and sophisticated vocabulary and provide a translation which is accurate and sounds natural into the target language.

Nevertheless, the situation significantly and unexpectedly changes when only isolated words or phrases are provided for translation or even extensive fragments, such as a long title or key points. In some cases, a semantic adaptation would be enough to construct the whole meaning, in some others the meaning may remain ambiguous, as a translation is provided which is very remote to the meaning in the original text:

- In the first part of the title, the concord of the adjective “*neschimbate*” is wrongly achieved with reference to the noun in the genitive “*zone*”, and not to the noun “*inflația*”.
- The title contains an omission of the auxiliary verb, which is a common headline convention in English, but in Romanian, the simple translation, without inserting the copular verb “*a fi*”, sounds awkward.
- The adjective “*further*” is rendered into Romanian by the adjective “*suplimentare*”, while a translation using “*mai multe reduceri*” would sound more natural.
- The adjective “*flash*” from the “*flash data*” is rendered into Romanian using a neologism formed from the same English noun, which has no connection with the meaning of the word in the original version, so the meaning of the word remains covert.
- The noun “*reading*” is translated taking into account its first meaning, that of “*citire*” or “*lectură*” and ignoring the context, while an appropriate translation would be “*valoarea să fie/ să ajungă la*”.
- The last key point is entirely mistranslated: “*Both the core and services inflation print re-accelerated compared to March’s readings*”—“*Atât prin tipărirea inflației de bază, cât și de servicii re-accelerate în comparație cu citirile din martie*”. This is probably due to the many collocations it comprises (“*core inflation*”, “*services inflation*”, “*inflation print*” and to the coincidence of the past simple form and past participle form of the verb “*to re-accelerate*”. An appropriate translation would be “*Atât inflația*

de bază, cât și cea din domeniul serviciilor au crescut/ au înregistrat o creștere accelerată comparativ cu valorile din martie”.

- When considering words or short phrases in isolation, the mistranslation occurring with fragments persists, but some additional errors can be spotted. For example, the past participle “*polled*” is rendered into Romanian by “*sonda*” (“verb: vota, efectua alegeri în, obține, tăia vârful”). The translation is flawed grammatically, as it does not agree with the plural noun, and the choice of the word also signals a contextually not appropriate equivalent. With all this, following the hints from the translation, the user can definitely infer the meaning of the word. However, when some context is added, so when “*economists polled*” is selected, the translation becomes accurate: “*economiștii chestionați*”. Another example would be “*inflation print*”, translated as “*imprimare inflație*”.

Gaps in translation can also be found from English into French and vice versa, but overall, the errors are fewer than in the case of English-to-Romanian translations:

- the noun “*reading*” is mistakenly taken as a gerund and translated by “*en lisant*” (noun: lecture, interprétation, connaissance, leçon, récitation, discussion, variante, explication, culture)
- „*flash data*” is translated by „*données flash*”
- “*core and services inflation*” is translated by “*inflation du cœur et des services*”.

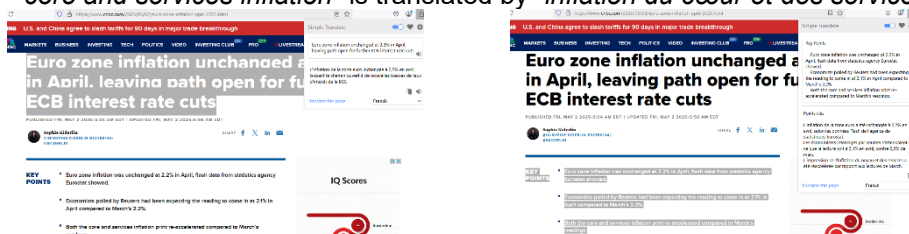


Figure 12. Translation from English into French by selected fragments using Simple Translate

The versions offered by Simple Translate are similar to those obtained through Google Translate. This is not surprising, as the add-on uses Google Translate, acting as an invisible bridge between the foreign language material and the translation engine.

The aim of the article was not to provide an exhaustive analysis of the syntactic or grammatical errors generated by activating language support add-ons. The choice of short texts was deliberate, as the purpose of the analysis was to present the capabilities of a modern tool, while also pointing out the hesitations or even errors that can occur in the absence of careful and attentive reading.

6. Conclusions

The emergence of AI tools that instantly provide good translations from and into almost all foreign languages is an undeniable help, but also a threat to individuals' wish to invest effort in learning and practicing foreign languages.

Add-on tools for language support allow people to quickly access the translation of selected fragments into any foreign language in real time, regardless of their size (entire page, paragraph, sentence, phrase, or word). The translations they provide are of

acceptable quality or even comparable with those generated by experienced translators and they are constantly improving. Therefore, in the future the translations generated are very likely to be of higher quality.

The great innovation of an add-on such as the Simple Translate compared to already existing and reputable translation applications lies in the presence of the popup translation button on the original page. This allows autonomous readers engaged in the active reading not to abandon the text written in the foreign language (more or less known), but to activate their personal comprehension strategies and to use the add-on only as a helpful tool.

Transforming the complex receptive activity of a written text in a foreign language, with everything it entails in terms of processes and skills, into a simple "click" command that generates a complete translation in a target language poses threats connected to language learning and acquisition. And this applies to any foreign language, whether international or not, regardless of users' level of proficiency. Direct translations are the easiest and quickest to obtain, but this can become a trap, as they have the disadvantage of not advancing readers' knowledge of the language or their language skills.

Personal linguistic progress can be achieved through active reading, which involves going beyond the linear reading of a text and engaging in conscious learning. Consequently, when switching from one foreign language to another, autonomous users who self-initiate reading should seek not only to understand the meaning conveyed by the text, but also to practice the foreign language in which the text was written. Instead of translating an entire page written in a foreign language, they can activate the translation tool on that page, which instantly provides the desired version of selected fragments.

In the future, it will become increasingly difficult to see foreign languages as we have traditionally seen them, because technology can no longer have a marginal role in receiving and even producing messages in a foreign language.

The process of integrating technology into learning can and must begin in school, where teachers can introduce diverse and innovative modern tools into their foreign language classes, which students can subsequently use in real-life situations. This would equip students with life-long learning skills that will help them become competent and autonomous language users. We actually expect that the definition of the competent and autonomous language user will soon change to involve, besides the command of foreign language skills, the readiness and ability to take advantage of modern tools that accelerate and enhance language learning, in line with sustainable language learning (Maican & Cocoradă, 2021).

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SECTION FINANCE, BANKING, ACCOUNTING AND AUDIT

FROM INTUITION TO ALGORITHMS: THE TRANSFORMATION OF DECISION-MAKING THROUGH INTELLIGENT DATA TECHNOLOGIES – A BIBLIOMETRIC STUDY (2019-2024)

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Abstract: *This paper examines the relationship between decision-making in the financial sector and the role of intelligent data analysis technologies. The present study uses bibliometric methods on articles published between 2019 and 2024, sourced from Web of Science and Scopus, and processed with Bibliometrix (RStudio) and VOSviewer. After filtering and unifying the datasets, a final sample of 2,522 articles was analysed. The results identify clusters, highlighting the growing emphasis on artificial intelligence, big data, and machine learning as tools to support decision-making. In addition to the existing mapping trends, this study highlights the structural organization of the field by identifying motor themes, emerging themes, and conceptual clusters that shape the current scientific dialogue. The combination of the two bibliometric analysis tools, R Bibliometrix and VOSviewer, improves the robustness of the results by ensuring cross-validation between the analytical tools. The findings confirm a paradigm shift: traditional reliance on intuition is increasingly being replaced by evidence-based approaches driven by smart technologies. The article provides a strategic perspective on how intelligent data analysis technologies are reshaping the decision-making process in the financial field, going beyond a descriptive overview of the literature. This study contributes to the literature by providing an updated mapping of research trends and outlining the evolution and multidisciplinary nature of this emerging research area, offering valuable insights for scholars and practitioners in finance and management. The results of the study indicate that current research integrates several fields, making it multidisciplinary. In this case, the study encompasses technological, economic-financial, and managerial fields.*

Keywords: bibliometric analysis; decision-making; intelligent technologies; Artificial Intelligence (AI); data analysis; finance

JEL classification: G40, G17, G11

1. Literature review

The decision-making process, both at the individual level and within organizations, can be supported by newly emerging intelligent data analysis technologies. In recent years, the adoption of such intelligent technologies to simplify decision-making has gained significant attraction. The digital era is characterized by an unprecedented volume of available data; however, this abundance of information does not automatically simplify the financial decision-making process (Huang and You, 2023). For this reason, the

current research examines and highlights, within the literature, the relationship between these two concepts and the evolution observed during the analyzed period. Bibliometric analysis, according to Öztürk, Kocaman and Kanbach (2024) can be understood as a methodological approach that quantifies and evaluates patterns in scientific publishing and a very used - meticulous method for discovering and to analyze large volumes of scientific data (Donthu *et al.*, 2021). By relying on statistical techniques and numerical indicators, it allows researchers to capture the dynamics of a field or journal over time (Madsen, Berg and Di Nardo, 2023a). Bibliometrics is a dynamic field that requires both flexibility and advanced analytical capacity, which can be achieved through tools such as R (RStudio, R packages) and VOSviewer. According to Aria and Cuccurullo (2017), R is both a programming language and a computational environment designed for statistical analysis and data visualization. One of the packages available in R is Bibliometrix, which provides a set of quantitative tools for research in bibliometric and scientific analysis (Aria and Cuccurullo, 2017). Because of these features, R is particularly suitable for bibliometric analysis (Aria and Cuccurullo, 2017). Another application widely used by researchers for bibliometric analyses is VOSviewer. VOSviewer is a software tool designed to facilitate the creation and visualization of bibliometric maps (Van Eck and Waltman, 2010). **According to Aria and Cuccurullo (2017), VOSviewer is a freely available Java-based software developed by Van Eck and Waltman to support the analysis and visualization of citation networks within scientific literature. Any research paper or study can be approached first by performing a bibliometric analysis related to the subject of the specialized field. Bibliometric analysis can be at the foundation of any research that is started. The starting point of any bibliometric analysis is the creation of the database.** The research questions underlying this article are: (Q1) Is there a connection between the topics of decision-making and intelligent technologies? If so, (Q2) At what level does the convergence between the two concepts occur? Bibliometric analysis is the most effective method for obtaining answers to these questions based on the current specialized literature.

2. Methodology of conducted bibliometric analysis

The methodology for the bibliometric analysis in this article integrates datasets extracted and merged using two applications specifically designed for bibliometric research: VOSviewer and RStudio (Bibliometrix). Two separate datasets were obtained from well-established scientific platforms: Web of Science and Scopus. On both platforms, the process of defining the exported dataset began with an advanced search query using the following combined terms: “decision-making process,” “decision making,” “data analysis,” “intelligent data analysis technologies,” and “AI in finance.” A specific time interval was set for the inclusion of scientific works: 2019 to the end of 2024. The chosen timeframe (2019–2024) reflects the accelerated expansion of AI-driven decision-making research. Filters applied to both databases restricted the sample to open-access articles in English within Business and Finance. Four data exports were extracted: three from the WOS database in BibTeX format and one from Scopus in CSV format. To merge the exports into a single database, I used R tools to convert the exports to data frame format and combined them into a single file. After merging the datasets and removing

duplicates with the help of RStudio, a final set of 2,522 articles was obtained. Bibliometrix in RStudio was then used to generate word cloud, descriptive statistics, keyword co-occurrences, a thematic map, and a factorial map. To validate the network co-occurrence analysis, the database was also analyzed using VOSviewer.

3. Bibliometric analysis

As a first step in this study, I aimed to identify the ten most relevant sources – those that have contributed most significantly to the publication of articles on the topic addressed. These ten academic journals are listed in the table below, along with the number of articles published in each, as determined using R Bibliometrix.

Table 1: The 10 most relevant sources from the database extracted

Sources	Articles
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	105
JOURNAL OF BUSINESS RESEARCH	78
IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT	51
MANAGEMENT DECISION	43
CONGENT BUSINESS & MANAGEMENT	39
FINANCIAL AND CREDIT ACTIVITY-PROBLEMS OF THEORY AND PRACTICE	39
JOURNAL OF BUSINESS ETHICS	39
ENTREPRENEURSHIP AND SUSTAINABILITY ISSUES	35
JOURNAL OF RISK AND FINANCIAL MANAGEMENT	33
BUSINESS STRATEGY AND THE ENVIROMENT	32

Source: Processed by author in R Bibliometrix

Analysis of the main journals covering these topics – decision-making processes and intelligent technologies – shows that Technological Forecasting and Social Change, Journal of Business Research, and IEEE Transactions on Engineering Management are among the leading sources. This indicates that the topic is clearly multidisciplinary. After reviewing the ten most relevant sources, a word cloud analysis was conducted using the R tool in Biblioshiny (Bibliometrix) to provide a visual representation of the prominence of specific terms within the analyzed database.



Figure 1: Word cloud visualization of database
Source: Processed by author in R Bibliometrix

Based on the results from the word cloud analysis, the most frequently used terms at the core of the database are decision-making, artificial intelligence, performance, management, and impact. These terms are the most prominent in Figure 1. After identifying the most frequent words in the database, I aimed to determine the frequency of each of the top ten terms. A keyword frequency analysis was conducted and is presented in Table 2 to identify the most commonly used terms.

Table 2: Top 10 keywords from the database extracted

Keywords	Frequency
artificial intelligence	377
decision-making	310
performance	231
management	195
impact	191
innovation	166
model	165
decision making	156
machine learning	132
sustainability	103

Source: Processed by author in R Bibliometrix

According to the results generated with Bibliometrix, the top keywords were “artificial intelligence” (377 occurrences), “decision-making” (310 occurrences), and “performance” (231 occurrences). Using the keywords identified from the database, a co-occurrence network was analyzed, as illustrated in Figure 2 and Figure 3. First, I conducted the analysis using RStudio, and then I introduced the database into VOSviewer to validate the results obtained from Bibliometrix.

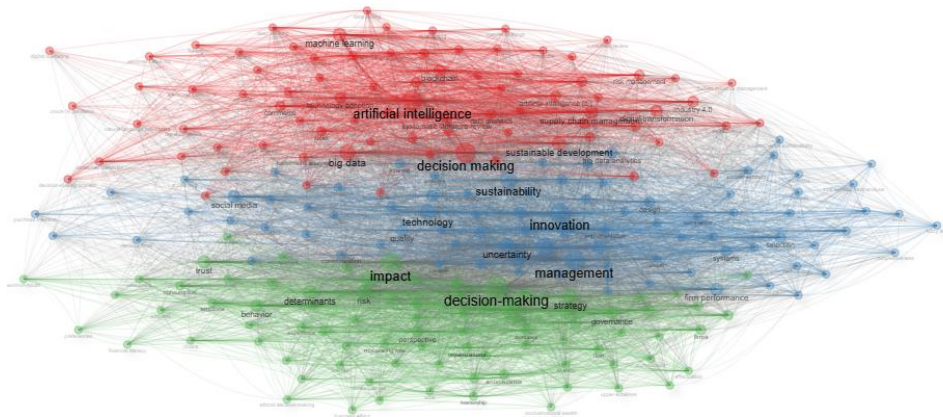


Figure 2: Network co-occurrences visualization of database

Source: Processed by author in R Bibliometrix

Based on the results obtained from Bibliometrix in the co-occurrence analysis, three clusters are illustrated, showing the internal links among the analyzed concepts. Cluster 1, shown in red, corresponds to concepts related to intelligent technologies based on the use of artificial intelligence. The red cluster represents the technological and digital area, focusing on the development and implementation of AI, digital transformation processes, algorithms, and new technologies applicable to industries and businesses. Cluster 2, represented in blue, includes the terms decision-making, innovation, and sustainability. Positioned between the other two clusters, it can be concluded that there are balanced connections between cluster 2 and both the technological cluster (cluster 1) and the managerial cluster (cluster 3). The blue cluster, as the central cluster, indicates that innovation and decision-making are key concepts linking technology to management. Cluster 3, shown in green, includes the terms management, impact, strategy, and organizational behavior. The analysis indicates that new technologies and AI impact innovation; innovation directly influences decision-making processes at all levels, and decision-making processes affect management and company-level results.

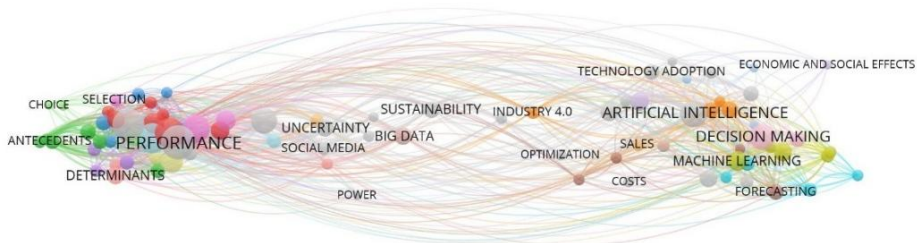


Figure 3: Network co-occurrences visualization of database

Source: Processed by author in VOSviewer

The map from Figure 3 highlights three major research clusters: (1) artificial intelligence and data-driven technologies supporting decision-making, (2) innovation and performance management, and (3) sustainability and managerial impact. The proximity between “artificial intelligence” and “decision-making” reflects the increasing integration of intelligent technologies within decision-making processes. While the co-occurrence network shows the conceptual connections that exists between keywords, the thematic map provides a broader view of their development and maturity. Based on the keywords extracted from my database, I analyzed the thematic map shown in Figure 4.

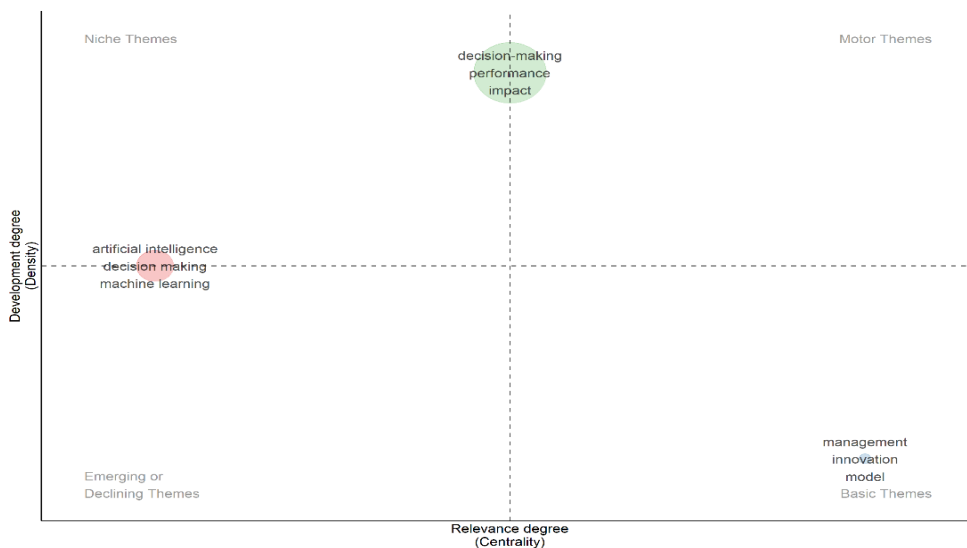


Figure 4: Thematic map of database extracted
Source: Processed by author in R Bibliometrix

The thematic map makes possible the visualization of important themes in the research field (Madsen, Berg and Di Nardo, 2023b). This map identifies the main, well-established themes (degree of relevance) and those that are still emerging but are increasingly explored by researchers (degree of development). From this analysis, I observed that “decision-making,” “performance,” and “impact” stand out as motor themes, demonstrating a high degree of centrality and development, while “artificial intelligence” and “machine learning” appear as emerging themes with growing relevance. These results suggest that the field is experiencing both technological and conceptual transitions. Meanwhile, “management,” “innovation,” and “model” are positioned as basic themes, providing theoretical and practical foundations for the domain’s evolution. I believe that interest in these topics will continue to grow, as they reflect current trends and offer many promising research opportunities that have not yet been explored in depth. Another bibliometric analysis performed to examine the trends and directions in the current literature among the analyzed concepts is the conceptual structure analysis, with the results shown in the next figure.

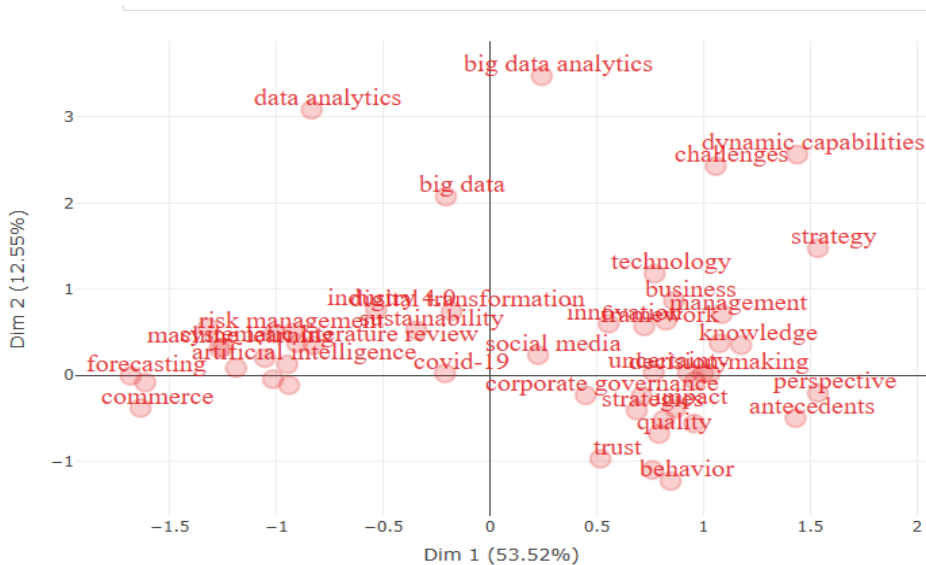


Figure 5: Conceptual structure map of database extracted

Source: Processed by author in R Bibliometrix

The conceptual structure map is created through factor analysis. The conceptual structure map visually displays how words that frequently appear in articles and research papers are organized and related. It highlights the connections between terms through a regional representation (Pai *et al.*, 2022). The factor analysis identifies two axes: the X-axis and the Y-axis.

- The X-axis (Dim 1 – 53.52%) represents the major directions in the literature. In this case, the axis separates two main directions in the literature: on the left are themes related to intelligent technologies (artificial intelligence, machine learning, big data, data analytics, industry 4.0), while on the right are themes related to decision, management, strategy, and performance (decision-making, innovation, governance, impact, trust).
- The Y-axis (Dim 2 – 12.55%) separates the internal subthemes into two groups: in the upper part are themes oriented toward analysis and managerial skills (big data, analytics, dynamic capabilities), while in the lower part are themes related to behavior and governance (behavior, trust, quality, governance).

Based on Figure 5, it is clear that the literature is organized around two main cores: on the left, smart technologies and data analysis; on the right, decision-making, management, and innovation. In the identified cores, there are also connecting themes that link the technological and managerial areas, such as sustainability, digital transformation, and social media.

4. Conclusions

The bibliometric analysis conducted using RStudio's Bibliometrix and VOSviewer applications reveals a substantial link between the concepts of “decision-making

process” and “intelligent analysis technologies.” The findings indicate a growing trend toward integrating intelligent technologies into decision-making processes, largely driven by significant advances in artificial intelligence in recent years. Additionally, the results indicate a growing number of studies and researchers concentrating on the convergence of these two fields, accompanied by an increase in their academic significance. This study contributes to a deeper understanding of interdisciplinary trends and provides a foundation for future research directions. Although the analysis covered publications from 2019 to 2024, future studies could expand this work by including additional databases or comparing developments across different economic sectors. Overall, the field appears to be in a phase of accelerated development, where artificial intelligence, data analytics, and decision-making processes are becoming increasingly interconnected. These dynamics highlight a clear shift from decision-making based solely on intuition to a digital transformation of management practices.

5. Limitations

The study also has limitations that must be considered. One limitation is that data from only WOS and Scopus were used for the analysis; therefore, the article does not cover the entire existing literature, and some relevant articles may be missing. Another limitation is that only open access articles were included, so high-impact articles published in closed journals may be absent from the database. Additionally, the selected time interval of 2019–2024 is a limitation.

6. Future directions

The study could be extended over a longer period by including more years, and the database could be analyzed using other tools for additional tests. For a more comprehensive extension, data exported from other sources, such as Google Scholar, IEEE Xplore, and SpringerLink, as well as the inclusion of articles beyond open access ones, could be considered.

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CHARTING THE EVOLUTION OF FINANCIAL THERAPY: 25 YEARS OF BIBLIOMETRIC JOURNEY

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Abstract: *Financial therapy has emerged as an interdisciplinary response to the intersection of financial stress, mental health, and economic behavior. Financial problems are not only determined by material barriers but also by factors such as anxiety, cognitive biases, impulsivity, maladaptive patterns, or financial trauma, which can find answers in financial therapy. While the field aims to mitigate maladaptive patterns - such as liquidity anxiety and impulse spending - through clinical intervention, its scientific structure remains fragmented. This study analyzes the conceptual evolution and network architecture of financial therapy research from 2000 to 2025, using a dataset extracted from the Web of Science and Biblioshiny software to perform a comprehensive bibliometric analysis. The results indicate that the field is anchored primarily in clinical psychology rather than economics, evidenced by a dense central cluster focusing on depression, anxiety, and Cognitive-Behavioral Therapy (CBT). Co-occurrence networks reveal a distinct sub-cluster defined by financial incentives and contingency management, which serves as the conceptual bridge connecting psychotherapeutic interventions to behavioral economics. The paper provides a quantitative benchmark for researchers, confirming that financial therapy is maturing into a distinct clinical discipline that integrates behavioral incentives with relational and trauma psychological care.*

Keywords: *financial therapy; behavioral finance; bibliometric analysis; Biblioshiny.*

JEL classification: *D91; G53.*

1. Introduction

Traditional economic theory has long relied on the assumption of the rational agent, presuming that individuals optimize financial resources to maximize utility. Recent empirical research indicates that individuals' financial decisions are influenced by emotional, cognitive, and behavioral factors, and that stress, financial anxiety, impulsivity, and cognitive biases generate personal economic difficulties. In this context, financial problems are not merely the result of material shortages but are often symptoms of psychological determinants such as anxiety, impulsivity, and trauma. Consequently, financial therapy has emerged as a distinct interdisciplinary field,

positioned at the intersection of financial counseling, emotion-focused psychotherapy, and behavioral economics. Its primary objective is to address maladaptive financial behaviors - such as compulsive spending, financial avoidance, or debt accumulation - by integrating financial planning with clinically validated protocols (Cognitive-Behavioral Therapy, stress management techniques, impulsivity control strategies, and behavioral monitoring tools). A significant role is played by behavioral finance studies focused on the role of irrational beliefs, investor sentiment, and incentives in explaining economic behaviors. The paper aims to expand on previous studies on financial therapy to nuance an emerging field that integrates cognitive, emotional, behavioral, relational, and economic dimensions of financial health. Field Britt et al. (2015), in their paper titled "Financial Therapy: Establishing an Emerging Field," elucidate the distinctions among financial therapy, financial coaching, and financial planning, underscoring the necessity for the advancement of financial therapy. Despite the growing recognition of the link between mental health and money, the field continues to be fragmented, with limited integration between the psychological literature (focused on emotional regulation) and the economic literature (focused on incentives and decision-making). Therefore, there is a pressing need to systematize the existing body of knowledge to identify dominant paradigms and collaborative networks.

This paper's leitmotif is the lack of a clear vision regarding the implications of financial therapy and the direction of expansion, despite a quarter of a century of research. The primary objective of this study is to provide a comprehensive bibliometric mapping of financial therapy literature from 2000 to 2025, using the Web of Science SSCI (Social Sciences Citation Index) dataset. By employing the Biblioshiny software, this paper analyzes the field's conceptual evolution, social structure, and thematic dynamics. The paper highlights recent trends in financial therapy publications, authorial and regional proliferation, and the topics that are topically relevant among academics.

The remainder of this paper is organized as follows: Section 2 reviews the theoretical underpinnings of behavioral investor analysis and the psychological mechanisms of financial decision-making. Section 3 details the methodology, describing the bibliometric and network analysis techniques used, including co-authorship and institutional collaboration mapping. Section 4 presents the results, visualizing the transition of the field from theoretical fragmentation to clustered areas of clinical specialization. Finally, Section 5 discusses the implications of these findings for researchers and practitioners.

2. Literature review

In recent studies, financial therapy is based on financial models. According to the Callenbach et al. (2024), outcome-based reimbursement models substantially reduce the financial exposure of payers when treatment effectiveness is not guaranteed, confirming the advantages of outcome-based models over standard discounts for extremely expensive gene therapies. In the same direction, Basu (2025) shows that the major determinant of budgetary pressure is price, not the financing instrument, indicating that setting prices close to "effective monopoly" could significantly alleviate budgetary constraints. A recent study discusses the effectiveness of mindfulness-based art therapy as a proactive mental health strategy for Generation Z students, a group

characterized by high levels of stress (Van Lith et al., 2021). Joint therapeutic interventions are being developed for couples facing both relational and financial stress for an integrative approach (Kim et al., 2011). Smith et al. (2017) considers the manualization of financial therapy for families to improve family dynamics and financial behaviors, aimed at reducing tensions generated by conflicts related to money.

Another part of the literature examines the financial inequities that limit access to mental health care. Whittingham et al. (2023) illustrate that group therapies would reduce national costs by more than \$5.6 billion and improve the accessibility of services for vulnerable groups, highlighting the importance of financial considerations in mental health service planning. The issue of financial stress also appears in studies dedicated to the effectiveness and accessibility of psychological therapies. Cavanagh et al. (2024) state that for therapists in training, personal therapy is both a professional resource and a significant economic burden, showing that economic barriers can limit training opportunities in mental health. Urbanos-Garrido & Agúndez (2025) suggest that the unmet needs of Spanish citizens due to financial reasons are strongly correlated with low socioeconomic status, disproportionately affecting women's access to specialized services. Paynter et al. (2025) disseminate their study, amplifying the direct relationship between the financial difficulties of autistic people and access to therapy as playing a crucial role in long-term healing. It appears that online financial therapy can minimize the barriers to face-to-face interventions and can extend services to low-income individuals who are in need of such assistance (Smith et al., 2018).

Solution-Focused Brief Financial Therapy (SFFT), applied in a session to set financial goals, can minimize short-term financial anxiety (Archuleta et al., 2020). A major vector of the literature is behavior-based financial interventions. The pilot study of Peck et al. (2023) highlights the role of financial incentive mechanisms in therapeutic engagement and reducing associated symptoms, confirming the legitimacy of contingency management models in the treatment of patients with PTSD and opioid abuse. Sheira et al. (2024) analyze how conditional cash transfers for HIV patients in Tanzania highlight their impact on depressive and anxiety symptoms but facilitate rapid entry into treatment, a decisive factor in the evolution of positive psychology. Ololo et al. (2024) address the area of applied psychology, where they demonstrate that a coaching program based on Rational-Emotive & CBT can increase financial risk tolerance and empower students' financial attitudes, providing evidence of the ability of psychological interventions to support more adaptive financial functioning. Smith, Malespin, et al. (2017) introduce financial therapy as prevention in the foster care system, tailored to the emotional and practical needs of young people leaving the care system, with a focus on vulnerable communities. The field of pharmaceutical management is examined by Wills & Mitha (2024), indicating the convergent preference of payers and manufacturers for outcome-based financial agreements, including rebate schemes for non-responders and price adjustment mechanisms, validating the overall dynamic towards mitigating financial risk and increasing resource efficiency in the architecture of financial therapy interventions within public policies.

Ford et al. (2020) points out that a collaborative model of financial therapy, open over the course of three sessions, can improve the couple's relationship and positively influence their intentions to seek additional support in identifying the emotional and rational identities associated with joint decisions. When discussing the benefits and challenges of integrating financial counseling with systemic therapy, emphasis is

placed on the importance of recognizing social inequities and the economic determinants of health (Gale et al., 2020). The differences between financial coaching and financial therapy are that financial therapy is more comprehensive because it addresses dysfunctional attitudes toward money, financial disorders, and past financial trauma (Delgadillo & Britt, 2015). In accordance with Shelton et al. (2019), the use of financial therapy in addressing the psychological, emotional, and behavioral components involved in acquiring financial skills, through the manualized "Five-Step Model," dominates in effectively guiding participants toward adaptive financial changes.

In general, the literature reveals that the interdependence between mental health and financial conditions are the building blocks of access to care, therapeutic adherence, and clinical outcomes. Reimbursement models and outcome-based agreements, financial incentives, the costs of psychotherapeutic services, and cognitive-financial coaching interventions are complementary tools used to reduce the economic burden and support mental well-being.

3. Methodology

The study aims to do a comprehensive bibliometric mapping of the literature in the field of financial therapy for the last 25 years (2000-2025). The data was collected from the Web of Science database, filtering publications included in the SSCI (Social Sciences Citation Index). The selection criteria focused on choosing articles, books, and book chapters in English to increase the coverage and relevance of the analysis. The fields covered were Psychology, Business Economics, and Behavioral Sciences, to emphasize the intersection between economics, finance, and psychology in the field of behavioral finance therapy. The final data set included 495 documents from 195 sources and 2,504 authors. Data processing was automated using Biblioshiny software from the Bibliometrix package in R Studio, which allowed us to establish parameters for citation, co-authorship, thematic evolution, and collaboration models in the field of financial therapy. The bibliometric analysis was modeled after Pritchard (1969), who opened up this horizon of quantitative understanding. Quantitative analysis underlines the current state of research progress in the field of financial well-being (Aria & Cuccurullo, 2017). In this line, Goyal and Kumar (2021), systematic analysis offers a comprehensive picture of financial education, its influence on financial planning and behavior, and its impact.

4. Results

Descriptive exploration of the scientific production on financial therapy (2000–2025) shows 495 documents from 195 sources and an annual growth rate of 8.09%. The author profile is structured around 2,504 researchers, with a pronounced culture of collaboration, a low number of single-authored articles (33), an average of 5.28 co-authors per paper, and a high degree of cross-border collaboration (24.24%). The conceptual richness (1,554 keywords) and an extensive theoretical basis (22,179 references) underline the theoretical robustness of the field. The average age of the documents (8.12 years) and the average of 23.22 citations/article confirm the maturity and growing academic impact of the analyzed literature.

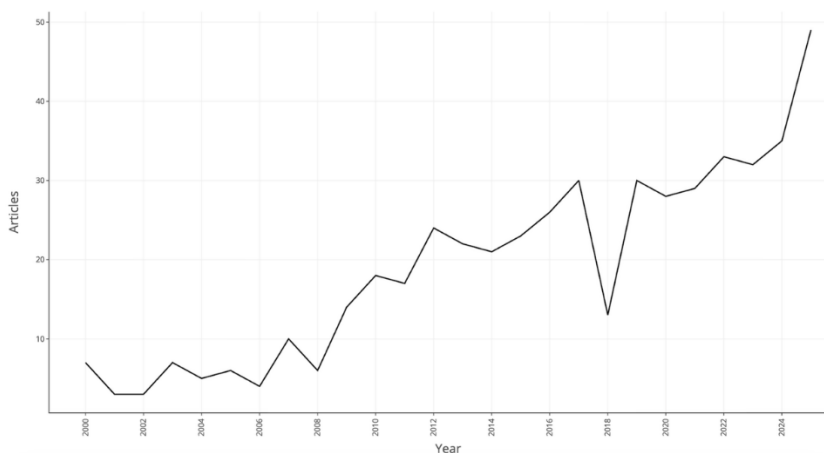


Figure 1: Annual scientific production on financial therapy.

Source: extracted by authors from Biblioshiny.

The longitudinal analysis of scientific production (2000-2025) reveals a distinct growth trajectory (Figure 1), reflecting the maturation of financial therapy from a niche topic to an established field. The initial phase (2000-2009) is characterized by limited output, marking the field's nascent stage. However, a structural break is observed post-2010, where publication volume shifts from linear to exponential growth. While a temporary contraction in production was recorded in the pre-pandemic period, the subsequent resurgence highlights the academic community's response to the heightened financial anxiety triggered by global economic instability. The last 25 years shows a high volatile average number of citations per document, with a steady upward trend until 2007, followed by a sharp retraction in 2008 and another peak in the 2010-2011 period.

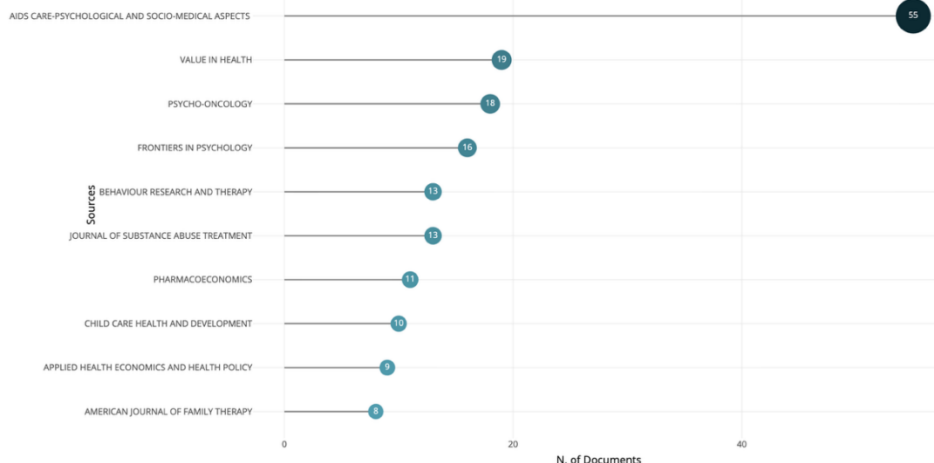


Figure 2: Most relevant sources in financial therapy.

Source: extracted by authors from Biblioshiny.

The distribution of publications by source shows that the field relies on a consistent core of specialized journals (Figure 2). The Journal of Medical and Psychological Socio- Medical Aspects dominates academic production with 55 articles, followed by two interdisciplinary journals covering health, behavior, and decision-making - Value in Health (19 articles) and Psycho-Oncology (18 articles). Journals such as Frontiers in Psychology (16 articles), Behaviour Research and Therapy (13 articles), and Journal of Substance Abuse Treatment (13 articles) complete the panel of publications focused on psychology, therapy, and public health. There is also a presence of journals focused on economics and health policy, such as Pharmacoeconomics (11 articles) and Applied Health Economics and Health Policy (9 articles), demonstrating a predominantly psychological and medical approach, coupled with financial analysis.

The cumulative evolution shows a pronounced heterogeneity in the dynamics of publications. AIDS Care-Psychological and Socio-Medical Aspects of AIDS/HIV dominates the entire quarter-century analyzed, with accelerated growth after 2010. Psycho-Oncology, Journal of Substance Abuse Treatment, and Behaviour Research and Therapy rely on smoother growth lines, which stabilize after 2015, emphasizing the maturation of the field at that time. The upward trend after 2020 of the journal Frontiers in Psychology denotes the attractiveness of the interconnectivity of fields around applied psychology and health.

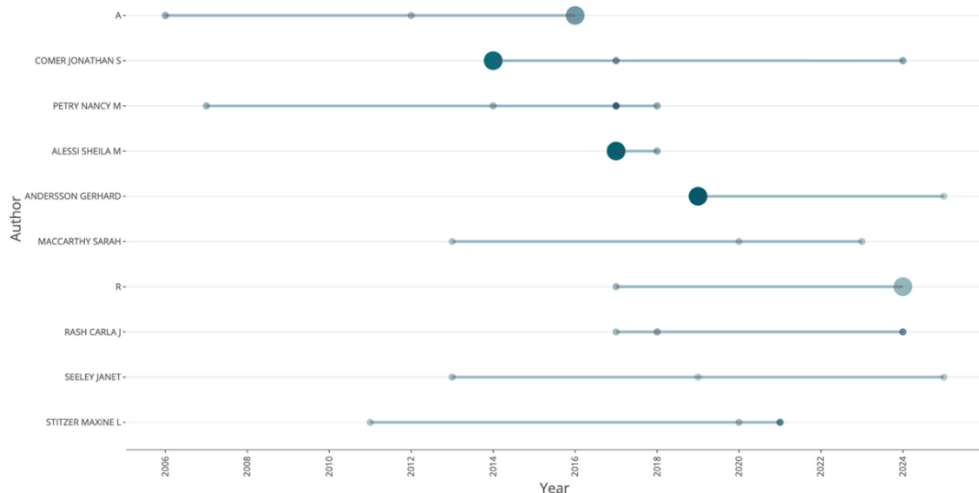


Figure 3: Authors' production over time on financial therapy.
Source: extracted by authors from Biblioshiny.

The temporal evolution of the most active authors' production reveals episodic contributions, with accumulations in limited intervals and long periods of absence (Figure 3). The trajectories of the authors differ significantly: Comer Johnathan publishes intensively after 2013, while Andersson Gerharh makes a significant contribution to literature starting with the pre-pandemic period and Petry Nancy in the first part of the analyzed period. The year in which an expansion of the field can be

observed is 2015, marking the dynamic interest in the applicability of psychological techniques in economic moments.

The list of the most prolific authors highlights the dispersed contributions of the field. In the top positions, three authors, each with four publications, constitute the top segment, forming a small nucleus of intense activity, and the next six authors have three publications each, marking a moderate but sustained involvement. The absence of a critical mass of notable authors is a characteristic feature of the field's maturation stage. The collaboration network between authors shows a fragmented structure with several independent micro-clusters, indicating the absence of an integrated research community. The only major cluster is organized around the contributions of Petry Nancy M., Rash Carla J., Alessi Sheila M., and Weinstock Jeremiah, reflecting the main pole of co-citation, aggregating around it the theoretical bulk of the literature. Isolated groups such as Comer & Doss, Hanscom & Gamble, Callenbach & Goettsch can be identified, with collaborations on specific sub-themes (economic evaluations, therapeutic interventions, and public health) but a lack of interconnectivity.

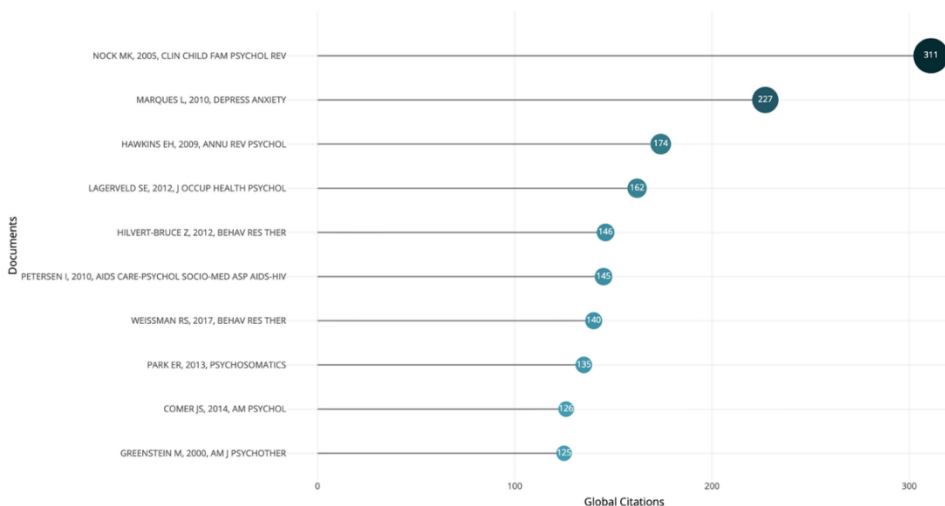


Figure 4: Most globally cited documents on financial therapy. Source: extracted by authors from Biblioshiny.

The list of the most cited papers in financial therapy demonstrated the dominance of clinical psychology and mental health, which frequently overlaps with studies on stress, maladaptive behaviors, and psychological well-being (Figure 4). The most globally cited paper (Baker and Wurgler, 2007) focuses on investor sentiment, defined as beliefs about future cash flows and risks not supported by facts, and shows how measurable waves of sentiment have significant, predictable effects on stock prices, especially for stocks that are hard to value or arbitrage. Nock (2005), Hawkins (2009), and Marques (2010) analyze the emotional, cognitive, and behavioral mechanisms associated with distress.

The research of Lagerveld (2012) and Hilvert-Bruce (2012) highlights the role of psychological health in the optimal functioning of the individual and in their capacity for emotional self-regulation, dimensions specific to financial therapy. The prevalence of these studies indicates the convergent nature of the conceptual field between psychology, behaviorism, and well-being strategies.

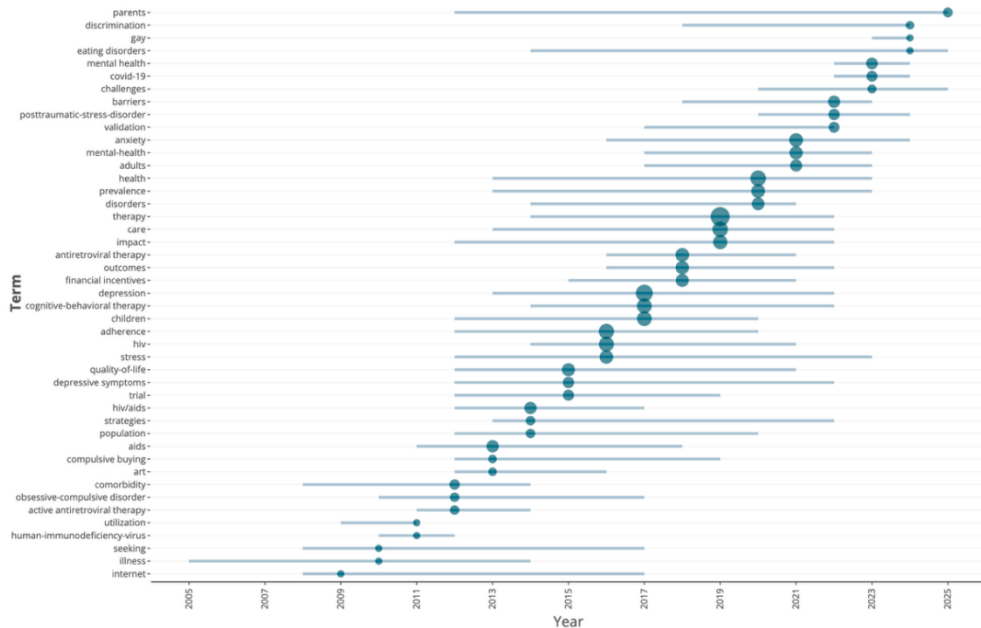


Figure 5: Trend topics on financial therapy.

Source: extracted by authors from Biblioshiny.

Topics in dynamic psychology propose fundamental constructs of clinical psychology and mental health, such as therapy, depression, anxiety, stress, cognitive-behavioral therapy, and adherence. These themes tend to coalesce around topics related to interventions, risk factors, and the outcomes of psychological treatments. The presence of concepts such as financial incentives highlights a conceptual bridge to behavioral economics. The research area is firmly grounded in psychology and the study of factors that shape human decision-making, emotional adaptation, and human self-regulation. The period 2015–2019 focuses on writings about CBT, depression, childhood, antiretroviral therapy, stress, care, and disorders, while in recent years, research has shifted toward discrimination, gender, eating disorders, mental health, and PTSD.

The mapping of terms signals the prevalence of terms specific to psychological health (therapy, depression, cognitive-behavioral therapy, mental health, stress, outcomes), which suggests that studies in the field of financial therapy conceptually overlap with research dedicated to psychological interventions. The predominance of psychotherapeutic concepts confirms that financial therapy is developing in an interdisciplinary environment, where psychological mechanisms are central to shaping financial behavior.

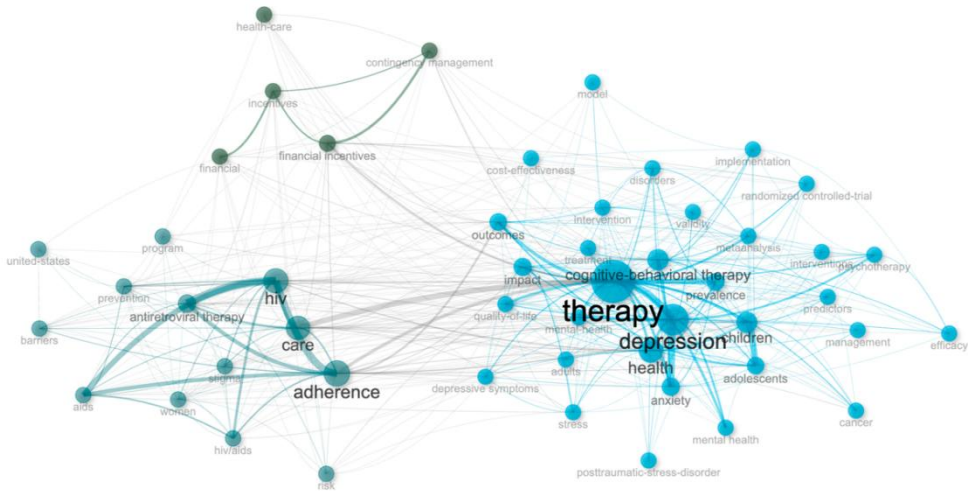


Figure 6: Co-occurrence network on financial therapy.
Source: extracted by authors from Biblioshiny.

The analysis of co-occurrence networks clearly aligns with the therapeutic sphere, highlighting semantic anchors such as therapy, depression, cognitive-behavioral therapy, and stress (Figure 6). Although most of the papers belong to clinical areas, a distinct subcluster composed of topics such as financial incentives, contingency management, and outcomes indicates a growing research impulse toward behavioral tools for stimulating decision-making behavior. These two research spheres intersect at the confluence of psychological interventions and financial behavior theory, adapting empirically tested therapeutic methodologies and principles. The bridge between the two central clusters can be seen in the application of cognitive-behavioral therapy in patient care and risk prevention.

Moreover, the visualized network is outlined under the identity of several clusters. The central cluster has dense nodes that gravitate around the terms "therapy," "cognitive-behavioral therapy," and "depression," suggesting the core of the analyzed corpus. On the margins, specialized clusters emerge one focused on adherence and antiretroviral therapy, highlighting the importance of medical and behavioral research; another focused-on treatment, financial incentives, and contingency management, distributed across therapeutic management and behavioral change strategies; and another opening up topics such as children, quality of life, distress, and pediatric or familial context. A smaller cluster addresses topics such as marital satisfaction, couples, communication, and maternalism, outlining the increased interest in relational psychology. The robustness of the thematic clusters nuances the center of gravity supported by behavioral therapies and mental health.



Figure 7. Countries' collaboration world map in financial therapy.
Source: extracted by authors from Biblioshiny.

An analysis of the geographical distribution of scientific output reveals a pronounced concentration in the United States, confirming its position as a leading player in specialized research (Figure 7). The United Kingdom, Australia, and Canada are becoming complementary research hubs, thus demonstrating the preeminence of the Anglo-Saxon world. China, Germany, and the Netherlands are strengthening the European-Asian group.

Collaboration patterns show that publications are mostly produced as internal collaborations (SCP), although the US and UK stand out with a high share of MCP as a degree of internationalization. The modest presence of countries such as Uganda, Nigeria, India, or Romania describes the gradual global expansion, encompassing emerging regions in the international academic circuit. The co-authorship map and international collaboration networks confirm the influence of Western institutions on the field that inspires financial therapy. Generally, the United States and the United Kingdom, where traditions of psychotherapy, behavioral interventions, and behavioral finance are well established. The fragmentation of collaborations between authors into small clusters outlines more robust themes involving stress management, risk behaviors, or the use of financial incentives. In this direction, financial therapy is defined as a crystallized field, located at the intersection of applied psychology, mental health, and economic behaviorism, supported by a Western collaborative infrastructure open to new therapeutic innovations.

Conclusions

This bibliometric analysis delineates the structural evolution of financial therapy, confirming its status as a distinct interdisciplinary field situated at the convergence of clinical psychology, behavioral economics, and mental health. The results

highlight researchers' preference for topics such as therapy, stress, cognitive-behavioral therapy, and financial incentives, which identifies key themes in behavioral financial language through emotional regulation and psychotherapeutic interventions. Thematic and co-occurrence networks confirm the paper's propensity for financial therapy shaped by depression, anxiety, coping, and maladaptive behavioral management. Cross-border collaborations show the dominant position of Western institutions, indicating maturity where there is a tradition in psychotherapy and behavioral finance. The bibliometric analysis suggests that financial therapy has not yet achieved a unified paradigm; it is positioned at the intersection of mental health and economics. To mature, the field must move beyond descriptive studies of financial stress and towards the validation of standardized clinical protocols. In fact, financial therapy is an emerging field of intervention that juggles with mature concepts of financial well-being (Nguyen, 2022). The bibliometric analysis of financial therapy is interconnected with financial education and behavior, as it indicates increased attention to psychological and behavioral factors. Financial therapy is positioned as an applied extension of this evolution, highlighting its role in transforming theoretical knowledge into therapeutic interventions (Ingale & Paluri, 2020). Finance-based interventions are early or partial forms of financial therapy, highlighting the positive effect on clinical and psychosocial outcomes. Financial therapy expands the psychological and relational dimensions of the financial behavior (Tsai et al., 2024).

Two primary limitations define the scope of this study. First, the exclusive reliance on Web of Science (WoS) data ensures high-impact sourcing but may exclude niche literature indexed in other databases. Second, the absence of a standardized taxonomy in financial therapy reflects diverse disciplinary origins. Future research should focus on expanding the research to the psychological mechanisms of emotional self-regulation, impulsivity, liquidity anxiety, and cognitive biases in individual financial decisions in risk and uncertainty contexts; moving from cross-sectional observations to longitudinal experimental designs that measure the long-term efficacy of financial therapy on wealth accumulation and debt reduction; and developing a consensus-based glossary to unify researchers from economic and psychological fields. Additionally, there are restrictions on studies regarding the therapeutic applications of financial therapy in vulnerable groups, including youth in the child welfare system, adults with mental health or substance abuse disorders, or families experiencing financial distress. Hence, we foresee the need to expand future studies to include rigorous empirical data on model standardization.

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EUROPEAN BANKING SECTOR IN THE ERA OF DIGITALIZATION. INNOVATION AND UPCOMING SCENARIOS

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Abstract. *European banking sector has a long history and has developed gradually with society. First representations of banking in European area are mentioned in ancient Greece and territory of the Roman Empire. To some extent this may be linked to the cultural and civilization level and to economic exchanges with other regions of the world. Furthermore, in these geographical boundaries are present indications of people that performed the role of bankers (European Investment Bank, 2000). After the fall of the Roman Empire, the banking activity entered in a period of downfall, witnessing rebirth of specific elements during the Early Middle Ages. Gradually it started to develop again, with the commerce done by Sweden and Italian cities, like Genoa and Venice. Italian towns developed trade activities with Byzantium, Egypt, North Africa and Asia Minor (European Investment Bank, 2000). Later, advances are registered with the medieval banking families in Italian cities, such is Medici in Florence (Karan et al., 2024) and German banking houses. Another significant moment is noticed during the extension of financial activity in Amsterdam, this having the role of first large securities exchange (Karan et al., 2024). European banking continued to develop in different modalities, specific to the political, economic and social realities. For example, towards the nineteenth century there were different approaches regarding the metal used for the coins in circulation, such is the case of gold for England and silver in German states, Austrian and Russian Empires and Scandinavia (European Investment Bank, 2000). Acceptance in the use of banknotes on a large scale took a lot of time, being strictly linked to the confidence level of the people and the concentration of issuing under central banking authority. In the last decades, innovation, technology and digitalization started to shape new realities inside the banking sector. This paper will analyze the impact of digitalization inside European market, how it has started, where it has arrived and how it could develop further.*

Keywords: *European banking sector; banks; digitalization; innovation; banking processes.*

JEL classification: *F00; G21; L86; M15; O31.*

1. Introduction

European banking sector has been under the impact of numerous transformations in the last years, being considered among the dynamic ecosystems of the society. The evolution has been produced by the social and economic realities, new consumer behaviour and customer aspiration to have personalized experiences from their banks.

European banking system has witnessed an increase in the values of operational, financial and reputational risks at industry level. Consequently, financial players have been required to increase the monitoring of market evolution and to implement new measures asked by legislators and market supervisors (e.g. new financial regulations: PSD2, NIS2, GDPR, DORA).

Furthermore, banks have been in the front row of digital expansion, their business processes being characterized by a significant percentage of technical innovation. Availability of a massive amount of info (Big Data) has forced the financial institutions to consider proper measures for storage, processing and protection. Implementation of innovation has conducted to the appearance of new risk categories, such as cyber and cybersecurity (Bajracharya et al., 2023), banks having to increase their portfolio of unforeseen events, prevention and mitigation actions.

The legislative framework at European level impacting the sector is quite extensive, some of the regulations being specific only to banks, some to other categories of financial entities (European Commission).



Figure 1: European legislation impacting the European banking sector (selection)
Source: European Commission

European Commission is addressing the impact of digitalization in finance, issuing a digital finance strategy, a retail payments strategy and several legislative actions (European Commission). Among them can be cited the Markets in Crypto-Assets Regulation or MICA, which offers one regulatory framework in the field. Service providers in crypto market have to ask for authorization to be present in European Union and follow requirements to protect investor crypto wallets. European Banking Authority will preserve a public register with non-compliant service providers. Second legislative initiative, the Digital Operational Resilience Act is presenting a background of requirements for the security of networks and information systems of

organizations present in financial area and of third parties offering ICT services to them. Furthermore, the Commission initiated a pilot regime for market infrastructures based on distributed ledger technology (European Commission).

As digitalization is founded consistently on AI, the European Union has issued the Artificial Intelligence Act. It has the objective to put in place a legal background to support the development of AI with the respect of fundamental rights of people and mitigating the risks associated with this technology (European Union, 2024).

2. Research Questions

There are several study questions that could be addressed, in order to have a better understanding of the research theme:

- Which have been the technologies that have transformed the European banking sector?
- What lessons can be learnt from the analysis performed?
- Which are the possible scenarios of evolution for European banking sector?

3. Methodology

In terms of methodology relevant literature has been reviewed and legislation in the field has been addressed and mentioned.

Historically have been identified the key moments associated with the implementation of specific technologies in the banking sector and how these are represented inside the structure of banking processes.

Based on the studies and articles reviewed, quantitative data has been identified and mentioned to show evolution of European banking sector.

For EU countries (where data is available) have been mentioned the initiatives in place and digitalization characteristics present in national banking sector.

Additionally, with accessible information, have been drafted some high-level conclusions that will be subject of future analysis.

4. Results and Discussions

Performing an assessment on the evolution of digitalization in European banking sector have been identified several periods, many of them associated to the launch of alternative channels. Initial moment is linked to the putting in place of the first automated teller machine in England, followed by Sweden – summer of 1967 (Thodenius et al., 2010).

In New York in 1982 have been launched the online services, when four of the city's major banks (Citibank, Chase Manhattan, Chemical and Manufacturers Hanover) offered home banking services using the videotex system (Cronin, 1997) (Koskosas, 2011). According to K Devi and Devadutta Indoria (2020) some financial institutions were offering electronic banking to their customers in 1985. Expansion on the use of electronic banking came into place in Europe and in other regions with the launch of the internet that has been one of the key innovations in business (Agwu, 2013).

Another key moment has been the launch of the first smart phone in 2007 that together with the internet changed forever the communication and interaction

behaviour in numerous economic and social processes and services. From that instant on, the innovation advanced continuously in most of the products offered by financial institutions.

Currently, there are mobile applications that include budget management, automated investments, scheduled payments, virtual cards, biometric authentication, smart phones being used on a large scale for financial services (Oliveira et al., 2016). Digital transformation contains cloud banking, API for integration with Fintechs (Gomber et al., 2018), tools for advanced analysis, artificial intelligence and chatbots answer to questions, identify client needs and propose personalized services. Furthermore, AI is utilized in fraud detection, to raise the cybersecurity level. Blockchain is bringing a new approach to the management of financial data, offering further transparency and security (Danțiș, 2021).

Among the priorities of financial sector is the design of client experience. This can be seen in the services that were requiring in the past, physical presence in the branches (Front Office) and can be done in present through alternative channels, centralized platforms and virtual assistants. In this perimeter can be included client on boarding, Know Your Customer (Arner et al., 2019), selling of financial services and products.

In Middle Office area can be seen automations in: analysis using Big Data and interactive dashboards, in Treasury processes or selling of investment products, utilization of alternative channels for communication, personalized offers, process digitalization (Von Solms et Langerman, 2022).

Back Office in banks is witnessing the use of AI for efficiency in standardized processes, decrease of payments' processing time, automation in data input or control execution, handling of documents (Ling et al., 2020).

As the retail area is offering numerous opportunities in business development, merchants can use smart phones for digital payments or benefit from the existence of e-commerce platforms (Paun et al., 2024).

The increase in the use of alternative channels and implementation of new technologies can be linked contemporarily (for sure not completely) with the decrease of domestic banking branches at European Union level.

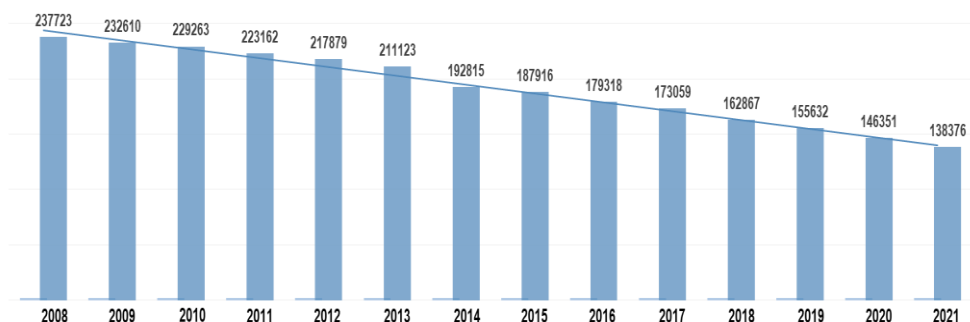


Figure 2: Number of domestic branches in the EU banking sector

Source: European Banking Federation. Banking in Europe: EBF Facts & Figures 2022

It can be seen that since 2008 the number of branches has decreased from over 237.723 units to 138.376 units in 2021.

The same study of European Banking Federation is showing a decrease in the number of employees in banking from 2.789.622 in 2008 to 2.149.178 in 2021.

Table 1: Number of employees in EU banking sector

Year	Number of employees
2008	2.789.622
2009	2.712.598
2010	2.681.757
2011	2.660.858
2012	2.609.098
2013	2.541.776
2014	2.485.753
2015	2.452.400
2016	2.413.639
2017	2.371.483
2018	2.296.454
2019	2.265.274
2020	2.219.044
2021	2.149.178

Source: European Banking Federation. Banking in Europe: EBF Facts & Figures 2022

Regarding ATMs in EU, for year 2021 are indicated 333,786 units, registering a decrease of 55.000 units compared to 2020. This value represents an indication regarding the increase in the use of digital channels and payments (European Banking Federation, 2022).

Performing a specific evaluation on the initiatives ongoing or digital implementations in various countries of the EU have been identified the following points (European Banking Federation), as it is shown in Table 2.

Table 2: Initiatives and characteristics of digitalization in banking in EU Countries

Country (data updated December 2024)
Belgium: electronic banking and mobile banking are increasing, most of the population using these channels. Strictly linked to digitalization and banking are mentioned challenges arising from financial literacy, cyber threats, increase of digital implementation, AI.
Cyprus: mobile solutions, contactless transactions, smart device applications.
Estonia: high utilization ratio of cards in payments, majority of payment orders are initiated electronically, small percentage of the population receives the salary totally or partially in cash.
France: significant development of innovation and FinTech, large exposure of the inhabitants towards electronic banking and applications.

Hungary: it is seen an increase in the volumes of electronic transactions.
Ireland: information shows an increase in the payments via cards.
Latvia: strong digital innovation, implementation of SCT instant payments (transfers available 24/7).
Luxembourg: innovative financial technologies, banks collaborating with FinTech actors.
Poland: positive representation for digitalization.
Portugal: it can be seen a significant increase in the use of internet banking, online access to accounts, issue of new cards and utilization of cards in online purchases.
Romania: challenges are seen in increasing the digitalization level and cybersecurity.
Slovakia: increase in the use of contactless cards, mobile and instant payments, card transactions.
Spain: investments in digitalization, towards new digital sales accounts, instant payments.
Sweden: high percentage of digitalization, with mobile banking, bank E-ID, e-invoices, cards and instant payments.
The Netherlands: efficient and innovative payment systems.

Source: European Banking Federation website

Information in the table is showing that many of the EU countries, if not most of them (not all data is available, further research necessary) have implemented to a smaller or extended level, digitalization inside their banking system.

Therefore, digitalization represents a strategic direction for each national and EU banking system. To highlight this statement, the European Banking Authority has a statutory duty to monitor and assess market developments, inside the Digital Finance, having the following priorities:

- decentralized finance, crypto and tokenization;
- artificial intelligence and machine learning;
- value chain developments.

Not only European Banking Federation is involved in understanding and monitoring the strategic digital transformation of the banking sector. European Central Bank has launched in 2022 a survey among 105 large banks to evaluate their digital approach, stating that results may require further assessment. The survey has concentrated around six areas (European Central Bank, 2023):

- digital strategy and KPI steering;
- digital business;
- investments and resources;
- governance and cooperation;

- use of innovative technologies;
- risks.

The results are quite interesting and provide further insights in terms of lessons learnt and guidelines for future developments. “43% of banks’ top 5 projects are aimed at revenue/customer experience enhancement and 83% of banks see process automation as a key lever to reduce costs (mainly through IT legacy transformation)”. Survey provides significant information in terms of resources allocated by banks for digital transformation. “On average, banks invested 2,8% of their operating income” and “allocated 5,2% of their workforce” in 2021 in this direction. Many banks have indicated that Senior Management is involved in putting in place of the digital strategy. Attention point is seen in identification and retention of skilled employees; therefore, many organizations cooperate with external organizations. Use cases are being opened for: API, cloud, AI and distributed ledger technology. For the last area, the risks associated to the digital transformation are cyber risk, dependency of third parties, AML/fraud, loss of customers. As challenges for the digital transformation are perceived: cybersecurity, legacy systems, lack of internal skills and cost management.

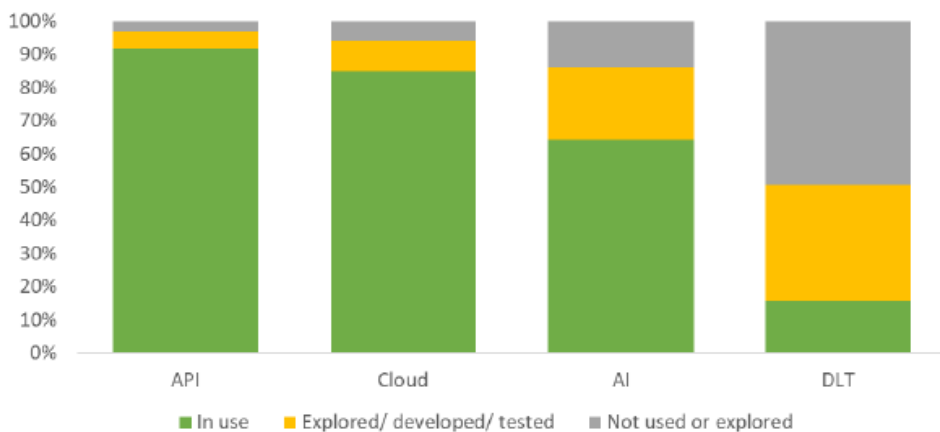


Figure 3: Adoption rates of innovative technology
Source: European Central Bank survey (2023)

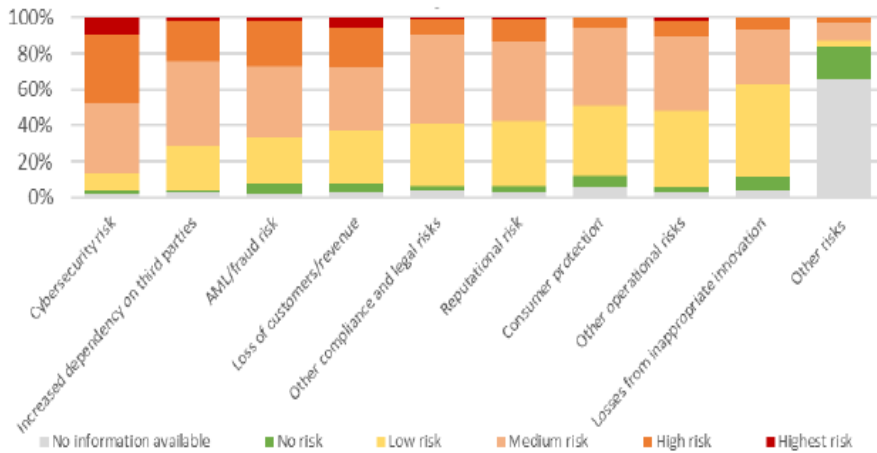


Figure 4: Key risks in digital transformation
Source: European Central Bank survey (2023)

5. Conclusions

The digital transformation of EU banking sector is far from being finished. It is still on going and will require further allocation of budget, resources and evaluation of projects launched.

What can be noticed is the fact that many of banking actors in the EU have enrolled in this journey of change of their business model.

It has been observed that implementation of digitalization provides to the industry several benefits: rises the operational efficiency, increases the customer satisfaction index, supports innovation of particular services, reduces costs, better risk monitoring allowing the staff to concentrate on critical activities. Nevertheless, these benefits have to be linked to the challenges and risks in place, as it was shown by the survey done by European Central Bank (2023).

Further assessments by market regulators or joint research should be launched and used for analysis of the projects and activities on going.

Based on the information evaluated and collected until now, can be mentioned for the future, the following directions:

- maintenance in the trend of domestic branch reduction;
- increase in the automation ratio of banking process, even for the ones that had an increased number of manual steps;
- growth in the budget and resources allocated for digital transformation by banking players. Organizations that will not invest in the development of this hybrid banking model should expect a decrease in their business value;

- opening of new projects by banks to implement additional measures of data storage and protection, reduction and prevention of cyber risk, putting into practice and compliance with various legislative requirements;
- extension of partnerships between banks, FinTech's, academia and other organizations.

An evaluation of the European Central Bank (2025), at the end of 2024 for Euro area has identified around 60 banks, having a business model founded only on digital. The same source indicates that the market share of digital banks increased from 3,1% of total assets in 2019 to 3,9% in 2024.

As a general idea can be stated that digital banks will continue to develop and to generate value. Citing Statista platform, in the digital banks (only) market, the projected Net Interest Income worldwide is set to reach US\$1.56tn in 2025. Looking ahead, it is expected that the Net Interest Income will display an annual growth rate (CAGR 2025-2030) of 7,07%, leading to a market volume of US \$ 2.20tn by 2030. Considering the above-mentioned forecasts, can be seen clearly the opportunity for market evolution and research, to analyze further the digital transformation of the European banking sector.

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MACROECONOMIC DETERMINANTS OF BANKING PROFITABILITY IN ROMANIA: EMPIRICAL EVIDENCE AND STRATEGIC IMPLICATIONS FOR AI ADOPTION

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Abstract: *This study examines the impact of key macroeconomic indicators on banking profitability in Romania, with the aim of establishing an empirical foundation for future research on the strategic adoption of artificial intelligence in the banking sector. Using annual data for the period 2010-2024, the analysis considers GDP growth, inflation rate and unemployment rate as determinants of profitability, measured through Return on Assets (ROA) and Return on Equity (ROE). The methodology employs multiple linear regression estimated in EViews, with HAC, robust standard errors to ensure coefficient reliability. The results indicate that the unemployment rate is the most significant macroeconomic factor negatively influencing profitability, while GDP growth and inflation show weak and statistically insignificant effects. These findings suggest that profitability in the Romanian banking sector is highly sensitive to labor market conditions, highlighting the need for enhanced credit risk prediction, portfolio monitoring and strategic decision-making tools. In this context, the research opens a relevant direction for integrating artificial intelligence models to improve forecasting accuracy, optimize asset management and strengthen institutional resilience under changing macroeconomic conditions. Furthermore, the study underscores that traditional profitability drivers, such as macroeconomic fluctuations, provide only a partial explanation of performance outcomes, reinforcing the importance of incorporating bank-specific indicators and advanced digital technologies in future analyses. By establishing a data-driven baseline of how external economic conditions affect profitability, the research creates a foundation for subsequent investigations into the role of AI-based risk assessment, default prediction and operational optimization tools, which may significantly enhance the ability of banks to anticipate economic stress, improve capital allocation and support more resilient financial strategies.*

Keywords: Banking Profitability; Multiple Linear Regression; Macroeconomic Indicators; Artificial Intelligence Models

JEL classification: G21; E44; C01

1. Introduction

The banking sector plays a fundamental role in supporting economic stability and development, acting as a key intermediary between savings and investment and influencing the efficiency of resource allocation in the economy.

The profitability of the banking sector represents a key indicator of financial stability and economic resilience. In Romania, the banking system has experienced multiple

structural transformations in recent years, shaped by global crises, inflationary pressures and fluctuations in economic growth. Understanding the factors that influence banking profitability is therefore essential for strengthening financial performance and ensuring sustainable development.

The main objective of this research is to empirically analyze the impact of key macroeconomic indicators, such as GDP growth rate, inflation rate and unemployment rate, on banking profitability in Romania, measured through financial performance indicators such as Return on Assets (ROA) and Return on Equity (ROE), using annual data for the period 2010-2024.

Moreover, the topic gains additional relevance in the context of the accelerating adoption of artificial intelligence (AI) technologies in banking. AI systems enhance decision-making processes in credit scoring, risk monitoring, fraud detection, pricing strategies and operational efficiency. However, the effectiveness of AI in supporting profitability ultimately depends on a clear understanding of the underlying macroeconomic variables that shape financial performance. Therefore, the findings of this study provide a necessary empirical foundation for future research exploring how AI-based tools may be integrated to improve profitability management, stress-testing, forecasting models and strategic planning within the Romanian banking sector.

This paper contributes to the existing literature by offering empirical evidence from a recent economic period and by outlining how AI-based analytical capabilities may support profitability optimization. The structure of the paper includes a brief review of relevant research, presentation of the methodological approach, discussion of empirical results and final conclusions with policy and strategic implications.

2. Literature Review

A recent study by Hussain and Zuhri (2025) examines the relationship between labor market conditions and banking profitability, focusing on the moderating effect of gross national income per capita. The authors find that rising unemployment significantly reduces both ROA and ROE, mainly due to higher credit risk and lower loan demand. Their findings highlight the importance of considering both macroeconomic conditions and structural financial characteristics when evaluating bank performance, reinforcing the need for more advanced tools, including AI-driven risk assessment models, to enhance resilience in fluctuating economic environments.

Spulbar and Birau (2019) emphasise that in transition banking systems the sustained profitability of banks depends not only on macro-economic stability but increasingly on their ability to anticipate and adapt to cyclical fluctuations. This insight underlines the importance of advanced analytical capabilities, such as artificial intelligence-driven forecasting and risk-assessment systems, as enablers of banking resilience in volatile macroeconomic environments.

Khan (2022) examines the determinants of banking profitability in GCC economies using a panel of 59 banks over the period 2011–2017 and employing OLS, fixed-effects and random-effects estimations. The results indicate that both internal bank characteristics and macroeconomic conditions significantly shape profitability. Bank size, asset quality, asset management efficiency and GDP growth exert positive

effects on ROA, while ROE is enhanced by bank size, asset management and GDP growth, but negatively influenced by capital adequacy, asset quality, operational efficiency and financial risk. The study underscores the importance of effective portfolio management and supportive macroeconomic conditions in driving banking performance, while also suggesting the need for more advanced analytical tools to anticipate risks in a sector strongly dependent on economic cycles.

Popescu and Spulbar (2025) show that emerging technologies such as blockchain, digital financial assets, and artificial intelligence fundamentally transform financial analysis through advanced models for risk assessment and forecasting macroeconomic conditions. The authors emphasize that these tools enable a faster and more accurate interpretation of the relationship between economic variables and financial performance. In this context, the integration of AI becomes a strategic direction for the banking sector as well, supporting efforts to strengthen profitability and resilience.

Spulbar and Cărbune (2025) show that the integration of Open Banking and AI technologies stimulates financial innovation by enabling rapid access to standardized data and the development of more accurate predictive models. This combination enhances scoring, risk monitoring and service personalization, thereby increasing the operational efficiency of banks. The relevance for assessing banking profitability is significant, as these technologies enable a more efficient integration of macroeconomic and microeconomic data into the decision-making framework.

3. Research Methodology

The aim of this research is to examine the extent to which key macroeconomic factors influence banking profitability in Romania over the period 2010-2024. This interval reflects significant structural, financial and technological changes within the Romanian banking sector.

Bank profitability represents a central indicator of financial system performance and resilience. In this study, profitability is assessed using two complementary measures: Return on Assets (ROA), which captures the efficiency with which banks utilize their asset base to generate earnings and Return on Equity (ROE), which reflects the return delivered to shareholders.

The research focuses on three macroeconomic variables that reflect broader economic conditions: the GDP growth rate, the inflation rate and the unemployment rate, because they strongly influence credit demand, interest rate conditions and repayment capacity, ultimately shaping the risk levels and profitability of banks.

To empirically evaluate the relationship between banking profitability and the selected macroeconomic factors, the following hypotheses are formulated:

H1: GDP growth has a positive and statistically significant effect on banking profitability (ROA and ROE) in Romania.

H2: The inflation rate exerts a negative influence on banking profitability.

H3: The unemployment rate has a negative and statistically significant effect on banking profitability.

These hypotheses will be tested through econometric estimation techniques, allowing for a comparative interpretation of how macroeconomic conditions shape profitability from both an operational and shareholder return perspective.

The datasets used in this analysis were obtained from reputable international institutions, to ensure data accuracy and comparability. Specifically, data for ROA and ROE were sourced from the International Monetary Fund, while the macroeconomic indicators, GDP growth rate, inflation rate and unemployment rate were collected from Eurostat. All variables were measured on an annual basis to maintain consistency and allow coherent cross-variable comparison. All variables were measured on an annual basis to maintain consistency and allow coherent cross-variable comparison.

Descriptive statistics indicate moderate profitability in the Romanian banking sector, with a relatively stable ROA and a more volatile ROE, suggesting greater sensitivity of shareholder returns to financial cycle fluctuations. Macroeconomic conditions reflect modest economic growth, alternating inflationary pressures and a comparatively stable labor market.

To examine the influence of macroeconomic factors on profitability, two multiple linear regression models were estimated using the Ordinary Least Squares (OLS) method, with ROA and ROE serving as dependent variables. To address potential heteroskedasticity and autocorrelation in time-series data, Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors (Newey-West adjustment) were applied, improving the reliability of the coefficient estimates. Pearson correlation analysis was also used to assess the initial direction of variable relationships.

The macroeconomic indicators listed above serve as independent variables in both models. The specification of the econometric models is presented in the following section:

Table 1: Selected variables

Acronym	Indicator	Unit
ROA	Return on Assets	Percentage (%)
ROE	Return on Equity	Percentage (%)
GDP_rate	Gross Domestic Product	Annual growth rate (%)
INF_rate	Inflation rate	Annual inflation rate (%)
UNEM_rate	Unemployment rate	Annual % of population in the labour force

Source: Author's contribution

For the implementation of the regression analysis, we employed EViews, a specialized econometric software widely used for time-series modeling and statistical evaluation in economic research. In this study, EViews was used to import and structure the dataset, generate descriptive statistics, compute the correlation matrix and estimate the two regression models with OLS. Additionally, EViews enabled the application of HAC standard errors (Newey-West) to ensure the robustness of the estimated coefficients. The reliability of the software in handling time-series data and delivering precise econometric outputs made it an appropriate choice for examining the relationship between macroeconomic conditions and banking profitability in Romania.

4. Findings

Table 2 summarizes the descriptive statistics for the variables used in the analysis: ROA, ROE, real GDP growth, inflation and unemployment over the period 2010-2024.

Table 2: Descriptive statistics

	GDP_RATE	INF_RATE	ROA	ROE	UNEM_RATE
Mean	2.666667	4.093333	0.773333	7.740000	6.973333
Median	3.200000	3.900000	1.200000	12.10000	6.100000
Maximum	8.200000	12.00000	1.800000	20.10000	9.100000
Minimum	-3.900000	-1.100000	-1.300000	-12.50000	4.900000
Std. Dev.	3.255910	3.502135	0.966929	9.779848	1.630279
Skewness	-0.681622	0.696413	-0.844059	-0.686001	0.205428
Kurtosis	3.088132	3.158653	2.375957	2.271984	1.283968
Jarque-Bera	1.166375	1.228210	2.024484	1.507748	1.945980
Probability	0.558117	0.541125	0.363403	0.470540	0.377951
Sum	40.00000	61.40000	11.60000	116.1000	104.6000
Sum Sq. Dev.	148.4133	171.7093	13.08933	1339.036	37.20933
Observations	15	15	15	15	15

Source: Author's contribution

The Romanian banking sector shows moderate profitability, with ROA averaging 0.77 percent and ROE averaging 7.74 percent. The considerably higher standard deviation of ROE relative to ROA indicates that shareholder returns were more volatile than asset-based returns, reflecting sensitivity to capital structure changes and financial cycle fluctuations.

The macroeconomic indicators show a modest average economic growth of 2.67 percent, alongside noticeable variation in inflation, which averaged 4.09 percent, reflecting alternating periods of price stability and inflationary pressure. The unemployment rate is comparatively stable, suggesting that labor market conditions fluctuated less sharply than output and prices.

The Skewness, Kurtosis and Jarque-Bera test results indicate that all variables are approximately normally distributed, supporting the application of linear regression methods without the need for variable transformation.

4.1. Regression Results for the ROA Model

The ROA regression model explains approximately 50 percent of the variation in bank profitability (Adjusted R-squared = 0.499) and the model is statistically significant overall (Prob(F-statistic) = 0.0189). Among the macroeconomic variables, the unemployment rate is the only significant determinant of ROA ($p = 0.0057$), with its negative coefficient indicating that higher unemployment reduces asset profitability of the banking sector by weakening credit performance. GDP growth and inflation show the expected coefficient signs but are not statistically significant,

suggesting a limited direct impact on ROA during the analyzed period. The model diagnostics confirm specification validity and robustness after applying HAC standard errors.

Table 3: Least Squares Panel

Dependent Variable: ROA

Method: Least Squares

Date: 11/07/25 Time: 21:15

Sample (adjusted): 2011 2024

Included observations: 14 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.136168	0.935905	4.419431	0.0013
GDP_RATE_1	0.028982	0.038326	0.756197	0.4670
INF_RATE_1	-0.039967	0.055844	-0.715688	0.4906
UNEM_RATE_1	-0.453804	0.129660	-3.499959	0.0057
R-squared	0.614667	Mean dependent var 0.842857		
Adjusted R-squared	0.499067	S.D. dependent var 0.963738		
S.E. of regression	0.682101	Akaike info criterion 2.307678		
Sum squared resid	4.652618	Schwarz criterion 2.490266		
Log likelihood	-12.15375	Hannan-Quinn criter. 2.290777		
F-statistic	5.317199	Durbin-Watson stat 1.891364		
Prob(F-statistic)	0.018934	Wald F-statistic 4.780441		
Prob(Wald F-statistic)	0.025666			

Source: Author's contribution

The model explains approximately 61% of the variation in ROA ($R^2 = 0.61$), which indicates a moderate explanatory power suitable for annual macroeconomic data. The Durbin-Watson statistic (1.89) suggests no autocorrelation problems and the use of HAC-Newey West robust corrections ensures the reliability of coefficient inferences.

The estimated regression equation for the ROA model is expressed as follows:

$$ROA = \beta_0 + \beta_1(GDP\_RATE_{t-1}) + \beta_2(INF\_RATE_{t-1}) + \beta_3(UNEM\_RATE_{t-1}) + \epsilon$$

Substituting the estimated coefficients:

$$ROA = 4.136168 + 0.028982 \cdot GDP\_RATE_{t-1} - 0.039967 \cdot INF\_RATE_{t-1} - 0.453804 \cdot UNEM\_RATE_{t-1}$$

The negative coefficient of unemployment indicates that weaker labor market conditions reduce asset profitability. The positive GDP coefficient suggests that economic expansion enhances bank performance, although the effect is not statistically strong. Inflation demonstrates no significant influence on ROA, which may suggest efficient interest margin adjustments by banks.

Table 4 – Correlation matrix

	ROA	INF_RATE	GDP_RATE	UNEM_RATE
ROA	1.000000	0.232181	0.231800	-0.839666
INF_RATE	0.232181	1.000000	-0.083711	-0.299787
GDP_RATE	0.231800	-0.083711	1.000000	-0.295150
UNEM_RATE	-0.839666	-0.299787	-0.295150	1.000000

Source: Author's contribution

The correlation matrix provides initial evidence regarding the relationships between banking profitability and the macroeconomic variables included in the study. ROA exhibits a strong negative correlation with the unemployment rate (-0.84), indicating that higher unemployment is associated with lower bank profitability. This relationship aligns with economic expectations, as deteriorating labor market conditions reduce repayment capacity of households and diminish credit activity. ROA shows a weak positive correlation with both GDP growth (0.23) and inflation (0.23). The weak correlation between inflation and ROA may reflect the ability of the banks to adjust interest margins to offset price fluctuations. The macroeconomic variables are only moderately correlated with each other and no values indicate problematic multicollinearity, which supports the suitability of including these variables in the regression model.

4.2. Regression Results for the ROE Model

The regression results indicate that among the macroeconomic variables included in the model, the unemployment rate is the only statistically significant determinant of ROE at the 5% level. The estimated coefficient for unemployment rate is negative and statistically significant (-4.4096 , $p = 0.0110$), implying that an increase in unemployment by one percentage point leads to a substantial decrease in bank profitability. This supports the notion that adverse economic conditions weaken credit demand and elevate credit risk, ultimately reducing banking sector performance.

Table 5: Least Squares Panel

Dependent Variable: ROE

Method: Least Squares

Date: 11/07/25 Time: 23:59

Sample (adjusted): 2011 2024

Included observations: 14 after adjustments

HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 3.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	39.42386	10.39350	3.793128	0.0035
GDP_RATE_1	0.341821	0.381100	0.896931	0.3908
INF_RATE_1	-0.181146	0.604699	-0.299564	0.7706
UNEM_RATE_1	-4.409552	1.416694	-3.112564	0.0110

R-squared	0.592721	Mean dependent var	8.414286
Adjusted R-squared	0.470537	S.D. dependent var	9.780503
S.E. of regression	7.116704	Akaike info criterion	6.997723
Sum squared resid	506.4747	Schwarz criterion	7.180311
Log likelihood	-44.98406	Hannan-Quinn criter.	6.980821
F-statistic	4.851064	Durbin-Watson stat	1.746826
Prob(F-statistic)	0.024634	Wald F-statistic	3.959724
Prob(Wald F-statistic)	0.042430		

Source: Author's contribution

The coefficient associated with GDP growth is positive, suggesting that economic expansion tends to improve profitability. However, the effect is not statistically significant, meaning that economic growth does not exert a consistent or strong influence on ROE during the examined period.

Similarly, the inflation rate displays a negative but statistically insignificant effect, indicating that inflation variability does not meaningfully contribute to changes in banking profitability under the observed economic conditions.

Overall, the model explains approximately 59% of the variation in ROE (R-squared = 0.5927), reflecting a moderate explanatory power. The Durbin-Watson statistic of 1.75 suggests no presence of significant autocorrelation in the residuals. The Wald F-statistic ($p = 0.0424$) confirms that the model is statistically significant as a whole. The estimated regression equation for the ROE model is expressed as follows:

$$ROE_t = C + \beta_1 \cdot GDP\_RATE_{t-1} + \beta_2 \cdot INF\_RATE_{t-1} + \beta_3 \cdot UNEM\_RATE_{t-1} + \epsilon_t$$

Substituting the estimated coefficients:

$$ROE_t = 39.42 + 0.34 \cdot GDP\_RATE_{t-1} - 0.18 \cdot INF\_RATE_{t-1} - 4.41 \cdot UNEM\_RATE_{t-1} + \epsilon_t$$

The results suggest that among the selected macroeconomic variables, the unemployment rate plays the most influential role in determining banking sector profitability in Romania during the period 2010-2024. Higher unemployment significantly reduces the return on equity, while GDP growth and inflation do not demonstrate statistically meaningful effects. These findings highlight the sensitivity of the banking sector to labor market conditions and underline the importance of macroeconomic stability in sustaining financial performance.

Table 6 – Correlation matrix

	ROE	GDP_RATE_1	INF_RATE_1	UNEM_RATE_1
ROE	1.000000	0.379697	0.128803	-0.757724
GDP_RATE_1	0.379697	1.000000	-0.064793	-0.351837
INF_RATE_1	0.128803	-0.064793	1.000000	-0.276252
UNEM_RATE_1	-0.757724	-0.351837	-0.276252	1.000000

Source: Author's contribution

The correlation analysis reveals several notable relationships. First, the return on equity (ROE) exhibits a strong negative correlation with the unemployment rate (UNEM_RATE_1), with a coefficient of -0.7577 . This finding suggests that an

increase in unemployment is associated with a significant decrease in banking sector profitability. Economically, this is intuitive: when labor market conditions deteriorate, households tend to reduce consumption and borrowing capacity, leading to lower lending volumes and potentially higher credit risk, which negatively affects bank performance.

ROE is found to have a moderate positive correlation with GDP growth (GDP_RATE_1), with a coefficient of 0.3797. This indicates that periods of economic expansion are generally associated with higher profitability in the banking system. However, the correlation is not strong enough to suggest a stable or direct dependence, which is confirmed later in the regression results.

Meanwhile, the correlation between ROE and the inflation rate (INF_RATE_1) is positive but weak (0.1288), suggesting that inflation has only a limited influence on the profitability of banks during the analyzed period. Similarly, the correlations among the independent macroeconomic variables are moderate to weak, indicating an absence of multicollinearity issues that could distort the regression estimates.

The results show that H1 is only partially supported, as GDP growth has a positive but weak influence on banking profitability, without representing a major determinant. H2 is not confirmed, since the inflation rate has no significant impact on ROA or ROE, suggesting that banks effectively adjust interest margins. In contrast, H3 is strongly supported: the unemployment rate has a robust and statistically significant negative effect. This confirms that labor market conditions are the primary macroeconomic factor shaping banking profitability in Romania.

5. Conclusion

The empirical evidence indicates that banking profitability in Romania is shaped primarily by labor market conditions, with both ROA and ROE declining as unemployment rises. This underlines the sensitivity of credit performance to periods of economic stress and emphasizes the importance of timely risk assessment. GDP growth contributes moderately to profitability, while inflation shows no significant effect, suggesting that traditional macroeconomic drivers alone do not fully explain profitability dynamics. These results highlight the need for banks to strengthen credit risk management and provisioning policies, particularly in response to labor market fluctuations. In this context, the strategic adoption of artificial intelligence becomes increasingly relevant, as AI-based credit scoring, default prediction models and automated portfolio monitoring can enhance early risk detection and support more resilient decision-making.

The findings of this study differ from part of the literature that identifies, for example, GDP growth as a strong determinant of banking profitability, as our results show only a weak and statistically insignificant relationship. This divergence may be linked to structural and regulatory characteristics specific to the Romanian banking sector and to the limitations of using a small annual dataset. These aspects suggest that macroeconomic variables alone do not fully explain profitability dynamics. Future research should therefore include bank-specific indicators, such as the net interest margin, cost-to-income ratio, loan-to-deposit ratio, non-performing loans ratio and capital adequacy ratio, to provide a more comprehensive understanding of

profitability drivers. Incorporating these variables would also support the assessment of how AI-based analytical tools can enhance risk management and operational efficiency in banking.

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THE HIDDEN RISKS OF GENERATIVE ARTIFICIAL INTELLIGENCE IN ACCOUNTING AND AUDITING: A BIBLIOMETRIC PERSPECTIVE

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Abstract: *Generative artificial intelligence has moved quickly from experimental systems to tools used in routine accounting and audit work. Large language models now assist in drafting audit documentation, summarizing contracts, interpreting unexpected variances and supporting elements of risk assessment. These uses promise efficiency gains, yet they also raise questions about evidence quality, professional judgement and the reliability of financial reporting. This paper examines how recent academic and professional literature addresses these issues. Based on a bibliometric analysis of 286 Web of Science publications (October 2025) that link generative AI with accounting, auditing or financial reporting, the study maps the structure of this fast-growing field. Using VOSviewer keyword co-occurrence analysis, frequency counts and close reading of influential works, the paper identifies four recurring groups of risks: persuasive but weakly evidenced AI-generated outputs, pressures on professional judgement including automation bias, data security and confidentiality vulnerabilities, and ethical or reputational biases embedded in training data. The results show a sharp rise in publications after 2023 and a pronounced interdisciplinary profile, with contributions from accounting, computer science, engineering and education. By connecting these risks to core concepts such as verifiability, audit quality and the public interest, the paper argues that generative AI alters the conditions under which professional judgement is formed and evaluated. The conclusion outlines implications for accounting education, organizational AI policies and future research on human–AI interaction and validation of AI-generated evidence. For practitioners, the framework can also serve as a simple checklist when deciding how and where to integrate generative AI into everyday accounting and audit work.*

Keywords: *Generative Artificial Intelligence (GenAI); Accounting; Auditing; Professional Judgement; Accountability; Ethics*

JEL Classification: *M41; M42; O33*

1. Introduction

Generative artificial intelligence, particularly large language models, has expanded rapidly from experimental applications to routine use in accounting and auditing. These systems now assist with drafting audit working papers, summarizing contracts, generating code for data extraction and proposing explanations for unexpected variances. Their appeal lies in efficiency and the ability to process large volumes of structured and unstructured data. Yet these developments also introduce concerns that touch core principles of financial reporting and assurance. AI-generated outputs often appear coherent and professionally crafted while being

incomplete, weakly supported by underlying evidence or affected by embedded bias. Such characteristics challenge expectations of reliability, faithful representation and verifiability. Although scholars and professional bodies have begun to address these issues, the literature remains fragmented across studies on automation, ethics, cybersecurity, governance and audit quality. This dispersion makes it difficult to form an integrated understanding of how generative AI reshapes professional judgement and the conditions under which accounting and audit work is carried out.

Against this background, the paper examines the following research question: How does academic and professional literature conceptualize the risks generated by the integration of generative artificial intelligence into accounting and auditing? The objective is to map this emerging field and identify the main risk themes that recur across disciplines. Addressing this question is important because it clarifies how GenAI affects the evaluation of audit evidence, the exercise of judgement and the credibility of financial reporting.

The study proceeds from the assumption that the risks associated with generative AI form identifiable clusters that can be revealed through systematic analysis. A bibliometric approach is appropriate here, as it captures both the quantitative structure of the research field and the dominant conceptual patterns within it. This perspective allows the study to detect areas of convergence and divergence across accounting, computer science, engineering and related domains.

The analysis uses 286 publications indexed in Web of Science as of October 2025, selected for their explicit connection between generative AI, accounting, auditing or financial reporting. VOSviewer is employed to generate keyword co-occurrence maps, supported by frequency counts and close reading of influential contributions. This combination of methods makes it possible to identify both structural patterns and substantive content in the literature.

The paper contributes by documenting the rapid growth and interdisciplinary nature of the GenAI–accounting–audit research domain, by identifying four recurring clusters of risk and by linking these themes to foundational concepts such as verifiability, audit quality and the public interest. The findings offer a clearer framework for evaluating AI-generated evidence, guiding professional judgement and informing organizational AI policies. They also highlight directions for future research on human–AI interaction, validation of AI outputs and the detection of bias in financial reporting and audit contexts.

2. Literature Review

This literature review was developed through a systematic process designed to identify, evaluate and synthesize academic and professional work on generative artificial intelligence in accounting and auditing. The review began by defining a central research question: How does the existing literature conceptualize the risks introduced by the integration of generative AI into accounting and audit practice? Guided by this question, the search strategy focused on keywords such as “generative artificial intelligence,” “large language models,” “accounting,” “auditing,” “financial reporting,” “automation bias” and “AI governance.” These terms and their variants were used across multiple academic databases, with Web of Science serving as the primary source due to its wide coverage of peer-reviewed research.

The search results were screened first by title and abstract, and then by full text, using criteria related to methodological transparency, conceptual relevance and publication quality. The selected studies were then organized and analyzed to identify recurring themes, contradictions and areas requiring consolidation. Three broad and partly overlapping strands emerged from this synthesis: research emphasizing automation and efficiency, work treating GenAI as a decision-support tool and studies focusing on risks, ethics and governance.

The first strand presents GenAI as a tool for automating routine tasks. Publications describe how large language models can draft audit working papers, summarize lengthy documents or assist with data extraction. When these outputs are reviewed by qualified practitioners, authors expect shorter reporting cycles and more time for non-routine analytical work (IFAC, 2023; IAASB, 2024a; IAASB, 2024b). This work highlights operational benefits but pays less attention to how automation interacts with judgement.

The second strand examines GenAI as a form of decision support. Here, the emphasis is on the model's capacity to integrate standards, internal guidance and external sources to propose accounting treatments, identify risks or generate alternative scenarios. These capabilities may strengthen professional judgement, yet their structured and confident presentation increases the risk of over-reliance and automation bias (OECD, 2023).

The third strand concentrates on risks, ethics and governance. These studies highlight concerns about hallucinations, limited transparency and embedded bias, noting that models trained on historical data may reproduce or magnify past patterns in ways that misclassify clients or sectors. Technical analyses describe vulnerabilities such as model inversion and membership inference attacks, which could compromise confidential financial data. Professional bodies emphasize that AI uses reinforces, rather than lessens, ethical obligations relating to integrity, objectivity and confidentiality, and requires clear documentation and strong internal controls (IAASB, 2024a; IAASB, 2024b; IFAC, 2023).

Taken together, these strands depict a research field that is expanding rapidly but remains conceptually fragmented. Automation, judgement, data security and ethics are often examined in isolation and without a shared framework (OECD, 2023; OECD, 2024; World Economic Forum, 2025). This fragmentation confirms the need for a structured synthesis. The present study addresses this by applying a bibliometric analysis of Web of Science publications to identify the main recurring risk themes and arrange them into four risk clusters. These are presented in Section 4 after the methodological outline in Section 3.

3. Methodology

3.1. Data collection

The bibliometric analysis was based on the Web of Science Core Collection. The aim was to capture publications that explicitly connect generative artificial intelligence with accounting, auditing or financial reporting. For this reason, I used a two-step topic search (TS), which required at least one GenAI-related term and one accounting-related term in the title, abstract or keywords:

TS = ("generative artificial intelligence" OR "generative AI" OR "GenAI" OR "ChatGPT" OR "large language models" OR "Gen AI")

AND

TS = (“accounting” OR “audit” OR “financial reporting”).

I did not set any time restrictions in the search. However, all retrieved publications were from the years 2023–2025, which reflects how recent the discussion on GenAI in accounting and auditing is. In a next step, I refined the results only by Web of Science Research Areas. I selected four areas: Business Economics, Computer Science, Engineering and Educational Research. After these filters, the final dataset contained 286 publications. For each item, I exported full records (including author keywords, Keywords Plus and cited references) and basic bibliometric indicators. The 286 documents had together 1,395 citations and an h-index of 19 (Figure 2).

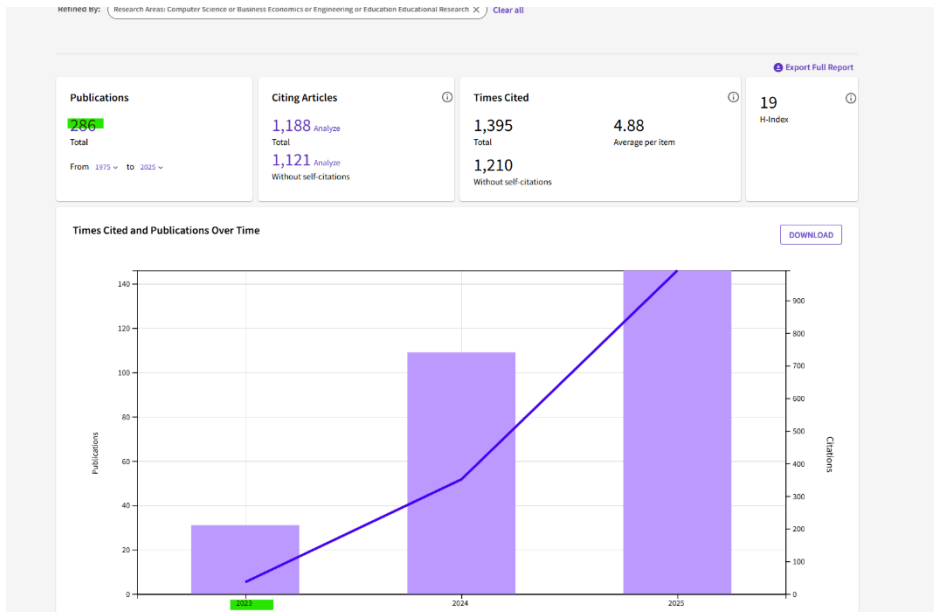


Figure 1: Web of Science overview of the GenAI-accounting publication sample (286 documents, 2023–2025)

Source: Author's elaboration based on Web of Science data

For the later qualitative interpretation of risk themes, the documents were also sorted by local citation counts and publication date. On this basis, I identified a smaller group of highly cited or conceptually influential papers, which were read in detail and used as reference points when interpreting the clusters from the mapping exercise.

3.2. Bibliometric mapping and clustering

To analyze the conceptual structure of this emerging field, I used VOSviewer to create a keyword co-occurrence map. The Web of Science records for the 286 documents were imported with full bibliographic information. Both author keywords and Keywords Plus were included, because the latter often capture recurring themes that are not visible in individual titles. VOSviewer was then used to construct a network in which nodes represent keywords and links represent their co-occurrence

Row Labels	Count of Value	Row Labels	Count of Value	Row Labels	Count of Value	Row Labels	Count of Value	Row Labels	Count of Value	Row Labels	Count of Value	Row Labels	Count of Value	Row Labels	Count of Value
Bias	6	TRUST	4	AI ethics	2	Cybersecurity	1	TRANSPARENCY	2	QUALITY	4				
biases	2	patient trust	1	AI Ethics	2	cybersecurity	1	TRANSPARENCY	1	Qualitative research	3				
AI bias	2	TRUST	1	cyberethics	1	cyber terrorism	1	Transparency and Eng	1	quality audit	2				
Algorithmic bias	1	trust in AI	1	Ethics education	1	cyberattack	1			QUALITY	1				
language generation biases	1	Grand Total	7	ethics	1	Grand Total	4	Grand Total	4	QUALITIES	1				
Anchoring bias	1			Ethical AI Adoption	1					Quality of experience	1				
bias mitigation	1			LLM Ethics	1	Row Labels	Count of Value			Qualitative content analysis	1				
Grand Total	14			Algorithm Ethics	1	Security	2			website quality	1				
				Ethical implications	1	data security	2			Grand Total	14				
				ethical AI in educati	1	Computer security	1								
				Grand Total	12	network security model	1								
						Security and privacy	1								
				Row Labels	Count of Value	identity security	1								
				Academic integrity	4	Cybersecurity	1								
				Research integrity	1	network security	1								
				Grand Total	5	Grand Total	10								

Figure 3: Pivot tables summarizing the frequency of risk-related keyword families
Source: Author's elaboration based on Web of Science data

The frequency of these keyword families provided a quantitative indication of which types of risk are most prominent in the current debate.

4. Results

4.1 Overview of the publication landscape

The Web of Science analytics confirm that work on GenAI in accounting and auditing is very recent. The number of papers rises sharply in 2024 and 2025 (Figure 1), and citations follow a similar pattern, in line with the public release and rapid adoption of large language models such as ChatGPT.

With regard to Web of Science subject categories, Business Finance is the most frequent label (77 records). At the same time, a large part of the dataset is classified under several Computer Science categories: Artificial Intelligence, Information Systems, Interdisciplinary Applications etc. Taken together, these labels confirm the interdisciplinary character of the field, where technical discussions of AI are combined with questions about financial reporting, assurance and accounting education.

The keyword analysis shows that the most frequent terms relate to ethics, trust, bias, data security, transparency and quality (Figure 4). This suggests a shift compared to earlier "AI in accounting" discussions, which focused mainly on efficiency and automation. In the current debate, risk, governance and trust are much more prominent.

Based on the VOSviewer network (Figure 3) and the keyword frequency analysis, four thematic risk clusters stand out across the 286 publications. These clusters are not predefined, but emerge from the way authors describe and connect GenAI with accounting and auditing. In the following subsections, I summaries each cluster.

4.2 Illusion of Accuracy and Financial Data Reliability

The papers in this cluster draw attention to something that many practitioners will recognize from their own experiments with GenAI: the model often sounds right when, in fact, it is not. It produces audit-style paragraphs, cross-referenced explanations and neat tables, and at a quick glance everything looks exactly as it should. Only when one starts asking "where does this number come from?" or "what test supports this claim?" do the cracks appear. Similar patterns are documented in the NLP field, where Venkit et al. (2024) audit different types of hallucinations in large

language models and show how confidently presented but unfounded outputs can mislead users.

Wang (2025) captures this very well with the term “accounting hallucinations”. He describes AI-generated audit comments that read like the work of an experienced senior, although no underlying procedure or working paper exists. Joshi (2025) reports a similar effect in forecasting and risk analysis: large language models generate detailed projections and risk indicators, but in some cases, these are only loosely connected to the underlying data, especially when the prompt is narrow or vague, a problem he labels “quantitative analysis distortions”. The OECD (2023) also notes that, when key financial information is missing, generative systems tend to “complete” the picture by inventing figures or relationships so that the answer appears coherent.

This behaviour clashes with the basic expectation of verifiability. Information in financial statements and audit files should not only look professional; it should be traceable to evidence. The real danger here is the explanation that sounds entirely reasonable but is wrong, and once it is accepted into the reporting process it can quietly distort indicators and mislead users of financial statements (Wang, 2025; Joshi, 2025; OECD, 2023).

4.3 Erosion of Professional Judgement and Accountability

In the second group of articles I reviewed, the focus shifts from what GenAI can do to what happens to the people who use it. Several authors describe a slow change in working habits. When accountants and auditors turn to GenAI for help with explanations, risk assessments or classifications, the model’s suggestion can quietly become the default answer. Instead of forming their own view first and then comparing it with the tool, some professionals start from what the system proposes and only rarely challenge it.

Choi and Xie (2025) analyze this tendency in a field study on early GenAI use in audit firms. They report signs of automation bias: in some situations, auditors accepted AI-generated assessments even when these differed from their initial judgement. Their results show clear efficiency gains, but also suggest that repeated exposure to AI output can weaken the normal reflex to ask “does this really follow from the evidence we have?”.

If this pattern continues, there is a risk that responsibility becomes blurred. The audit opinion or financial statements are still signed by a human, yet important parts of the reasoning may, in practice, have been shaped by a system that has no ethical duties and no legal accountability. Several authors warn that this is a more profound threat than simple job automation. What is at stake is the habit of independent, critical thinking that has traditionally defined professional judgement in accounting and auditing (Choi and Xie, 2025; Croom, 2025).

4.4 Data Security and Confidentiality Risks

In this cluster, the authors stop talking about “smart tools” in abstract terms and go back to a very old concern in accounting: keeping client information safe. General-purpose accounting systems already store extremely sensitive data about companies, contracts and sometimes identifiable individuals. When the same data are now sent through GenAI applications, very often running on external cloud infrastructure, they leave the protected environment of the firm. The gain in analytical

power comes together with a wider circle of systems and people who might, in theory, access or recover that information.

The technical and legal literature does not talk about these risks in abstract terms, but points to a few very concrete issues. Studies on model inversion and membership inference show that, under certain conditions, parts of the data used to train a model or provided through prompts can be reconstructed from what the model outputs. The Hogan Lovells (2024) report illustrates this with practical examples and explains how such attacks could reveal confidential financial information if client data are used to fine-tune GenAI models. Yan et al. (2025) arrive at a similar conclusion for GPT-based applications, showing how so-called “file knowledge leakage” can allow information from documents that should remain separate inside an application environment to be inferred from the model’s behaviour. Other papers note that prompts and training sets may be logged or cached inside the provider’s environment, so that traces of sensitive data remain in the system longer than users expect. All of this sits uncomfortably next to strict rules such as the GDPR and to the traditional duty of confidentiality in the accounting profession. The OECD (2024) argues that, as GenAI is adopted more widely in finance, firms can no longer rely on generic IT policies, but need explicit data governance for AI: clear rules on who may upload which information into GenAI tools, how long it is stored, what encryption and access controls apply, and how data flows are recorded and monitored (Hogan Lovells, 2024; OECD, 2024).

4.5 Ethical and Reputational Biases

In this part of the literature, the focus moves away from what GenAI can do from a purely technical perspective and turns instead to the more discreet effects that its use may have in accounting practice. Because these models are trained on large sets of historical data, they inevitably take over past habits in recognition, valuation and risk assessment. If certain regions, sectors or types of entities have been treated in a particular way over a longer period of time, the model can carry these patterns forward and apply them in new situations. A recommendation that looks neutral at first glance may therefore reproduce older preferences and biases, rather than offering an objective view of the specific case being analyzed. Wilson and Caliskan (2024), for example, show that large language models used in résumé screening can replicate intersectional gender and racial bias, even when the screening procedure is presented as neutral and fair.

A second concern is that many GenAI tools operate in a very opaque way. When an AI system flags a client as high risk or leans towards one accounting treatment, it is often difficult to see why. The IAASB (2024) notes that in an audit this lack of explainability is more than a technical issue, because auditors must be able to justify their conclusions. IFAC (2023) also warns that automation can make processes faster while, at the same time, introducing new vulnerabilities that are harder to detect. For this reason, several reports argue that AI used in finance should be both explainable and open to independent scrutiny, so that its behaviour can be tested against professional values of fairness and transparency (World Economic Forum, 2025; IAASB, 2024). In the end, the standing of the accounting profession depends not only on correct figures, but also on whether stakeholders can trust the methods and algorithms that helped to produce them.

5. Discussion

This discussion expands upon these findings by examining the profound implications of utilizing GenAI on accounting integrity, professional judgement, and ethical governance. Generative AI is changing how accountants do their jobs and what trust, judgement, and accountability mean in the digital age. The real issue is no longer how fast technology changes, but how well the industry uses its power. As algorithms get better at what they do, professionals need to be more careful and aware of what they do.

Accuracy, caution, and moral responsibility have always been the most important things in accounting (IAASB, 2024a; IAASB, 2024b). Smart systems that can copy human expertise without taking responsibility are now testing these foundations. GenAI can speed up analyses, automate reconciliations, and make predictions more accurate. However, it also makes it harder to tell the difference between automation and interpretation. When AI-generated results appear flawless yet lack factual basis, the illusion of accuracy poses greater risk than the error itself (OECD, 2023; Wang, Y. 2025; Joshi, R. 2025; Venkit et al., 2024; Croom, 2025).

The results show that the quality of accounting in the future will depend less on how AI tools improve and more on how strong human oversight and professional skepticism are. Accountants must transition from passive technology users to discerning interpreters of information. They must question, confirm, and challenge algorithmic reasoning. Technical skill alone will no longer be the most important thing that decides who is the most expert. Instead, it will be the ability to know when to have faith in the outcome.

In this new digital world, knowing about ethics is now a technical skill (IAASB, 2024a; IAASB, 2024b; Wilson and Caliskan, 2024). It is now a professional requirement, not just a theoretical ideal, to have clear ways to hold people responsible, to be able to trace AI-generated conclusions, and to be able to see how algorithms work. It is both a legal and moral duty to explain GenAI's financial predictions when they have an impact on markets and people's lives.

To do well in this environment, the profession needs to learn how to be digitally skeptical, which means being accurate while also being aware of ethics. Accountants should think of AI systems as partners that need to be checked all the time, not as experts who can't be questioned. The credibility of the profession will increasingly depend on its ability to evaluate technology: to understand how conclusions are reached, assess the reliability of outputs, and ensure that human judgement remains the primary safeguard of trust (Choi and Xie, 2025; OECD, 2023).

GenAI won't replace accountants, but it will be hard for people who stop thinking critically. The future of accounting will not be those who use technology the most, but those who understand it well, question it smartly, and use it responsibly.

6. Conclusion

This study contributes to the current debate on GenAI in accounting and auditing by offering a bibliometric overview of a very recent body of literature and by organizing the main risk-related concerns into four themes. The analysis shows a rapid growth of publications after 2023 and a strong interdisciplinary character. At the same time, it indicates that the evidence base is still relatively weak and fragmented. Concerns

about accuracy, judgement, data security and ethics are often discussed separately, using different concepts and terms.

The four themes: illusion of accuracy, pressure on professional judgement and accountability, data security and confidentiality risks, and ethical and reputational biases underline that GenAI is not just another efficiency tool. It influences how financial information is produced, how it is justified and how it is perceived by users of financial statements. Keeping financial information reliable therefore requires more than compliance with existing rules. It requires a governance culture in which innovation is aligned with the public interest and where AI use is documented, monitored and open to review.

For practice and regulation, the results suggest that explicit AI policies are needed at firm and system level. These policies should clarify which data may be uploaded into GenAI tools, how outputs are validated, who is responsible for decisions based on AI-generated analyses, and how bias and security risks are addressed. Professional bodies and standard setters, together with organizations such as IFAC, IAASB and OECD, can support this process by providing guidance that links ethical principles such as integrity, objectivity and confidentiality to concrete requirements for AI transparency and oversight.

Future research should move beyond general statements about opportunities and risks and focus on practical frameworks for responsible GenAI use. Possible directions include methods to detect and mitigate algorithmic bias, procedures for validating AI-generated audit or accounting evidence, and designs for training programmes that strengthen critical thinking in a GenAI environment (OECD, 2023; Wang, 2025; Joshi, 2025; Choi and Xie, 2025). Cross-disciplinary collaboration between accountants, data scientists, educators and regulators will be important for turning these ideas into workable tools.

Overall, the findings point to a simple conclusion: GenAI will likely become part of the normal infrastructure of accounting and auditing, but it cannot replace professional judgement. The long-term credibility of the profession will depend less on the sophistication of the technology and more on the integrity, transparency and skepticism with which that technology is used.

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ESG ASSESSMENT AND REPORTING: A BIBLIOMETRIC ANALYSIS

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Abstract: *Within the past two decades, ESG (Environment, Social and Governance) dimensions transitioned from voluntary corporate initiatives to a regulated context fuelled by frameworks such as the UN's Principles for Responsible Investment (2006) and the EU's Corporate Sustainability Reporting Standard (2022). The paper aims to analyse how the literature developed over time in respect of ESG assessment and reporting within the last two decades, focusing mainly on how the trends shifted in time, but also how the key themes involving these key concepts progressed throughout the studied period. The article used bibliometric analysis of scientific periodicals from Web of Science database between 2004 and the current period. The scientific papers selected by the keyword plus function, searching by „ESG and assessment or reporting” were exported for processing in the R Studio (bibliometrix package) computer program. The results of the analysis show an increase in the publication counts coupled with the changing focus of the research which indicates the relevant role that ESG factors play in promoting sustainable business practices.*

Keywords: *ESG assessment, ESG reporting, reporting transparency, ESG factors, bibliometric analysis*

JEL classification: Q56

1. Introduction

In recent years, significant changes occurred in the ESG landscape, mainly driven by the adoption of mandatory sustainability reporting standards in the EU, the US, and the IFRS Foundation which highlighted the conceptual differences between sustainability and financial reporting (Wagenhofer, 2023). Unlike the early twenties, when disclosures about corporate social responsibility (CSR) were voluntary, nowadays there is a legislated requirement for companies to publish large sets of additional financial and non-financial data linked to ESG. In this evolving context, it is essential to understand the historical development of ESG and anticipate its future trajectory.

In recent years, several literature review studies have been carried out to explore several facets of ESG. According to Dwibedi et al. (2024), the main topics studied in recent years in this area are performance and content analysis of high-quality articles of ESG research, link between ESG and firm performance and trend, ESG disclosure and its impact on firm performance.

2. Data Sources and Analysis Method

To gain an understanding about the publication trends and key terms evolution involving “ESG assessment and reporting”, we used bibliometric analysis. The study consistently examined Web of Science (WoS) Core Collection database, a multidisciplinary database of scholarly journal articles. Until two decades ago, namely the year 2004, WoS was the only international and multidisciplinary database available to obtain the literature. From 2004, Elsevier introduced Scopus, leading now to an alternative for researchers. We used WoS because it was noted that WoS has a strong coverage, considering also journals dating back to 1990. Adding to this, during our search stage, we used the “keyword plus” function in both databases. The completeness data report from biblioshiny identified the keyword plus field for Scopus database as missing in nearly 70% of the cases, marking the field as critical.

The sample of articles analysed was extracted as a result of the combination of the following keyword plus with Boolean operators “ESG AND assessment OR reporting”. The first search generated 60,369 documents. After scrutinizing, cleaning up and filtering the data with additional fields such as: “publication years”, “Web of Science Categories”, “languages”, “research areas”, and “document types”, we obtained a dataset of 1,202 articles.

We then uploaded the final dataset in R Studio, biblioshiny package, for analysing and visualising the shift and possible patterns in the technical literature, through a bibliometric research approach (Aria and Cuccurullo, 2017).

As an object-oriented and functional programming language, R allows for automated analyses and custom function creation (Aria and Cuccurullo, 2023). Its open-source nature fosters community support and continuous contributions from prominent statisticians.

3. Methodology

3.1. Annual scientific production

The analysis, shown in Figure 1, addresses the first research question, which in turn drives the research aim of this article: *What is the production trend for the topic of ESG assessment and reporting?* It depicts the increase in the number of studies related to ESG assessment and reporting from 2004 to 2024. This data can be subdivided, to visualize and explain better the evolution analysis, into the following four periods: 2004-2009, 2010-2014, 2015-2019 and 2020-2024, for which the total number of publications is 43, 170, 356, and 633 respectively, doubling or more the production in each time frame.

During the early period of data collection, the growth trend from 2004 to 2009 seems to have low content as there were few publications aiming to further investigate the area of interest and about the significance of the concept (Eccles et al. 2014). However, with the increasing popularity of sustainable development, the scholarly attention spiked as well leading to a significant increase in publications during the years 2010-2014. This period also marked a new stance on the topic that shifted the focus towards the incorporation of ESG factors into business and investment practices.

The years between 2015 to 2019 saw more studies on the impact of ESG parameters and how key players in the economy can utilize them, the total output then was 356

articles. This growth also coincided with the stressed regulation as well as growing concern towards climate change that attracted many scholars to research ESG disclosures and their influence on companies.

Starting from the year 2020 to 2024, there was a development in the number of publications with a total of 633 articles. A particularly sharp increase can be seen in the years of 2023 and 2024 where there are more than 150 articles published in each year.

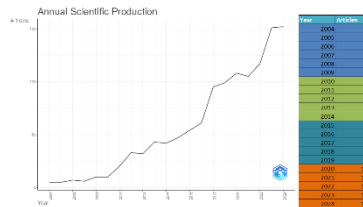


Figure 1: Annual scientific production of publications, 2004-2024
Source: Authors' computation in R.

3.2. Thematic keywords evolution

Figure 2 provides a classification of the previous body of research which directly answers our second research question: *Which key themes contain the ESG assessment and reporting?* It, in fact, gives more information about the focuses of the different themes within the scope of ESG research throughout the years. The figure illustrates the evolution of the ESG research themes from one time range, as used in 3.1, to another, indicating a change in trends of the academic, in line with the growth of the discipline.

In the first time frame, from 2004 to 2009, different themes dominate research which include "corporate annual-reports", "earnings", "self-reports", and "transformational leadership" among others. These themes are focused on comprehending the basic mechanisms and motivation that drive the compilation of corporate reports, with particular interest on frameworks that motivate report disclosures (Gray, 2006).

In the period from 2010 to 2014 more themes began to be central issues such as "financial-reporting standards" and "model". This indicates that during this period, scholars' focus was adjusted towards the interest in modelling, standardization, and the understanding of how corporate decisions might be influenced by practices aligned with ESG principles.

Between 2015 and 2019, the emphasis shifted to assessing "the impact" of sustainable practices together with "self-reported affect" and "reporting quality". In this regard, there was more focus on the impact of ESG factors on the companies' "performance" and also on the credibility and the accuracy and transparency of the data that was reported (Khan, Serafeim, & Yoon, 2016).

In the most recent period from 2020 to 2024, focus areas include "reporting practices". In addition, "impact," "annual-report readability", and "financial-reporting standards" emerged as key areas of focus. The presence of themes like "fees" further enforces the motivation about the costs of capital for ESG compliance requirements (Boffo & Patalano 2020). Therefore, this period highlights an important stage of development of ESG research where the focus is now on the reporting quality and the economic costs of reporting.

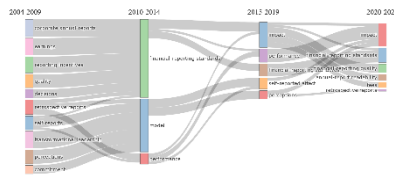


Figure 2: Thematic evolution of the keywords, four-time intervals (2004-2024)
Source: Authors' computation in R.

3.3. Most frequent keywords

As shown in Figure 3, from 2004 to 2024, publications on ESG had a number of core keywords, the most common of which were ranked on the basis of frequency of usage in the publication.

The most occurring keywords were “impact,” “performance,” and “quality”, with over 180 occurrences for each, which points to the fact that a significant amount of research has been done seeking to find out what are the results and effectiveness of various ESG practices used.

Noting the most common keyword “impact” which appeared in the publications for 215 times, impact and effectiveness appear to be the main focus in most research, this emphasis is in investigating how ESG factors can influence various aspects of corporate behaviour, stakeholder perceptions, and even environmental outcomes. This is important when evaluating measurable outcomes and how ESG practices can improve companies' performance.

“Performance” and “quality,” as mentioned, appear to be the second and third most mentioned terms with 189 and 188 mentions occurred respectively. This implies that the two mentioned terms seem to add focus where the key pillars of examining how corporations are performing and how useful ESG standards are enhancing the quality of reporting non-financial performance. This trend of “financial-reporting quality” (186 occurrences) and “financial-reporting standards” (165 occurrences) highlights a researchers' concern trend focusing on the frameworks for enhancing transparency, precision, and consistency in ESG reporting.

“Earnings management”, “determinants”, and “information” are other important keywords that are in top ten given the occurrence of more than 160 times.

“Earnings management” applies to the studies that are interested in how companies are able to employ the use of ESG reporting to achieve better or good financial results or influence stakeholders. The keywords “information” and “determinants” suggest that there are factors of interest that are driving the requirement and the type of corporate practices that require ESG reporting.

The mention of “disclosure” (150 occurrences) and “corporate governance” (140 occurrences) also underscore the relationship between the amount of transparency and the governance structures which are in place for reporting ESG company's performance. These themes are consistent with thinking on the need for accountability, investors, and the growing regulatory demands for more uniformed and standardized ESG reports (Schoenmaker & Schramade, 2019).

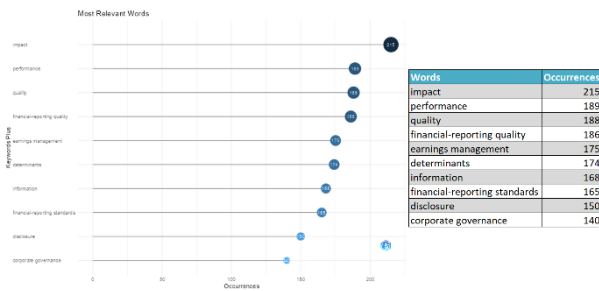


Figure 3: Most occurred keywords since 2004 to 2024.
Source: Authors' computation in R.

As the Figure 3, the Figure 4 highlights the most relevant keywords connected with ESG assessment and reporting in the publications of the over past two decades. It confirms and makes more robust the most occurred keywords analysis, giving the same result for number of frequency and adding the percentage of frequency based on the total amount of the publications in our collected dataset.

The analysis is represented as a treemap which categorizes keywords based on the occurrence frequency and proportion in the dataset. It is like the Figure 3 but the treemap format can offer a better visual distribution of keyword importance, with larger blocks signifying more often occurring terms, reflecting their relative importance in the field of ESG assessment and reporting literature. The frequency, stated in percent terms, highlights the importance of the ESG-related argument relative to the number of all the articles collected, giving us a better understand and visual of the keywords' occurrence.

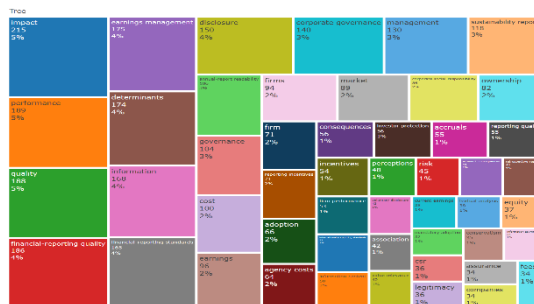


Figure 4: Tree map relevant keywords.
Source: Authors' computation in R.

3.4. Co-occurrence keywords network

The keywords related to assessing and reporting on ESG have also been analysed and their interconnections have been highlighted in a network (Figure 5). The nodes in the networks are keywords, the size of each node, from the greatest to the lowest divided in coloured clusters, corresponds to the frequency of their occurrence in the literature, and the edges between the nodes with the lines depict the relationship between the themes. The greater the edge, the stronger the relationship, or the

greater the number of times the more the two themes appear to be connected together (the red cluster).

At the centre of the network there are the keywords, “impact”, “quality”, “performance”, and “disclosure” thereby suggesting that these themes are central to ESG studies. The finding that the keywords, “impact” and “performance”, are highly dependable with the focus on measuring and evaluating what is achieved through ESG practices (Eccles, Ioannou, & Serafeim, 2014; Friede, Busch, & Bassen, 2015). These words are in high correlation with “management”, “information”, and “determinants” meaning that those words assess how managerial actions or informational determinants affect the impact of ESG.

ESG research has been subdivided into distinct clusters in which specific sub-fields are incorporated. The blue cluster consisting of “financial-reporting quality”, “earnings management”, and “corporate governance” demonstrates the specific area of research focusing on governance mechanisms that enhance trust and transparency of ESG reports. The above is consistent with efforts aimed at mapping companies’ governance structures with a focus on eliminating greenwashing and enhancing report credibility.

The orange cluster, centred on “financial-reporting standards”, includes terms such as “adoption” and “economic consequences”, and shows concern over the regulatory regimes and their economic effects, which is crucial for the companies in the adoption of the ESG standards across the sectors, as stated by the European Commission (2020).

Other minor clusters, such as the purple one, which incorporates “sustainability reports” and “corporate social responsibility”, as well as the green cluster, which incorporates “annual-report readability” and “information-content”, point to further dimensions of research. These clusters encompass the topics of CSR and practices related to sustainability disclosures and attempts to improve the readability of reports for stakeholders.

This network analysis, therefore, accentuates the interconnection of ESG themes, highlighting both foundational and emergent topics in the literature. The centrality of impact and performance keywords shows a continued focus on the effectiveness and outcomes of ESG practices, while the thematic clusters define the nature of ESG research, analysing and studying governance, regulatory frameworks, and report readability.

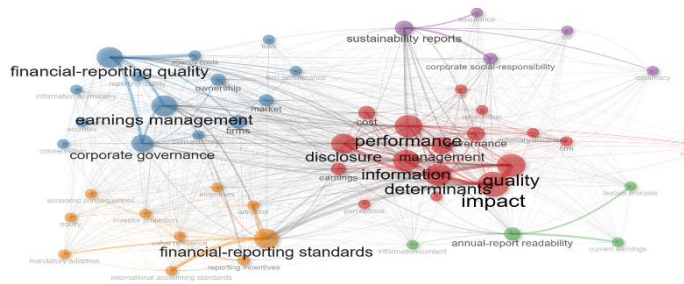


Figure 5: Co-occurrence keywords network.

Source: Authors’ computation in R.

3.5. Thematic map of keywords

The analysis showed in the Figure 6 provides two complementary views of the keyword's investigation. On the left, a thematic map organizes keywords based on two axes, density and centrality. Thematic maps are mainly useful in bibliometric analyses to decide which themes are well developed and fundamental to the field and which instead are emerging or marginal. In fact, themes like "performance", "impact", "financial-reporting quality", and "sustainability reports" appear in the upper-right part of the map, indicating that they are both very central and with much density. This suggests that these themes are well developed and central in the field of ESG assessment and reporting, reflecting a well-known literature and a fundamental part in current research, as highlighted by Friede, Busch, & Bassen (2015). Otherwise, topics in the lower-left part of the map, such as "reporting quality" and "annual-report readability", are showed as emerging themes that may require further investigation and development.

On the right part of the Figure 6, the keyword co-occurrence network represents and illustrates visually the interconnections between various topics. Therefore, keywords such as "performance", "impact", and "quality" appear fundamental and are centrally located, confirming their importance in ESG research. As the Figure 5, the network is structured by colours, highlighting different thematic clusters: for example, the green cluster around "sustainability reports" and "quality" specifies a theme focused on reporting quality and sustainability outcomes. In the same way, the orange cluster around "financial-reporting standards" includes related keywords like "adoption" and "regulation", reflecting interest in the adoption and standardization of ESG reporting practices.

These pictures together support the importance of the central themes such as impact, performance, and reporting quality in ESG research, signalling, in the meanwhile, areas of growing interest that may outline the future direction of this field.

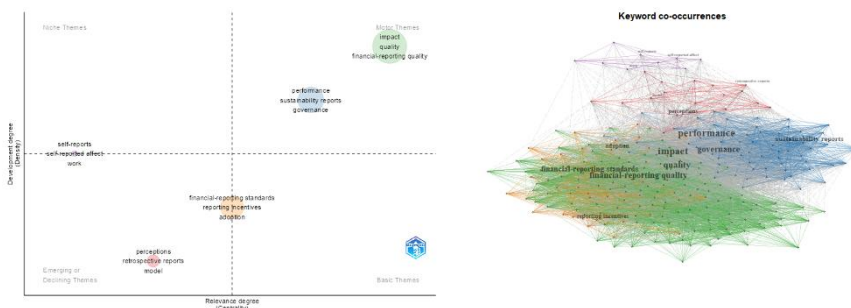


Figure 6: Thematic map of keywords.

Source: Authors' computation in R.

3.6. Most cited documents

This analysis provides a classification of the most cited articles which directly answers our last research question: *Which are the most relevant articles about ESG assessment and reporting?*

In the past two decades, a growing interest was placed on ESG and how these influence the existence of the businesses. By reviewing the most quoted 15 articles,

we tried to understand what the focal points are, trying to cluster the main topics covered and analyse the concepts presented.

Recently, investors, governments, and shareholders have viewed ESG (Environmental, Social, and Governance) issues as a critical risk management issue. Companies are now incorporating these considerations into their competitive strategies (Galbreath, 2013). In his assessment of ESG performance over time, Galbreath (2013) analyses the progression of ESG performance utilising ESG ratings for the selected companies.

Numerous authors have studied ESG ratings in their studies, highlighting various aspects of how these ratings are calculated and their impact on issues such as financial performance, comparative analysis, and discrepancies across different rating agencies (Berg et al., 2022; Christensen et al., 2022; Avramov et al., 2022). Both Berg et al. (2022) and Christensen et al. (2019) examine the inconsistencies in ESG ratings among different agencies, attributing these to differences in measurement methods, scope, and weighting. Berg et al. identify measurement as the primary factor, while Christensen et al. suggest that increased disclosure may worsen disagreements rather than resolve them.

In addition to measurement methods, scope, disclosure size, and weighting, company size seems to also influence ESG ratings. Drempetic et al. (2019) found that larger firms tend to achieve higher ESG scores due to their greater resources for disclosure, raising concerns about potential rating biases. Tamimi and Sebastianelli (2017) conducted an empirical analysis of S&P 500 companies, revealing that larger firms with superior governance practices have higher ESG disclosure scores, thereby supporting Drempetic et al.'s findings.

Avramov et al. (2021) analysed how uncertainty in ESG ratings affects asset pricing, showing that increased rating uncertainty raises market premiums and impacts the risk-return profile of stocks.

ESG ratings are important as they represent the expression of the ESG performance and are used by stakeholders in evaluating and classifying companies from a sustainable point of view. Tan and Zhu (2019) link ESG ratings to increased corporate green innovation, particularly in China, where higher ratings alleviate financial constraints and boost managerial environmental awareness.

Both Chen and Xie (2020) and Giese et al. (2019) find a positive relationship between ESG disclosures and financial performance, with the latter identifying specific transmission channels through which ESG ratings influence equity valuation. Chen and Xie (2020) extend this theme, showing that ESG disclosures attract investors with ESG preferences, which in turn positively moderates the relationship between ESG ratings and financial performance.

Researchers argue that that superior CSR performance, particularly through better stakeholder engagement and increased transparency, reduces capital constraints, enhancing access to finance. The impact spans across both social and environmental dimensions (Cheng et al., 2013). In the same direction, showing how better ESG scores can influence the financial performance, Eliwa et al. (2021) find that both ESG performance and disclosure are valued by lending institutions, leading to lower debt costs. Their study differentiates between substantive performance and symbolic disclosures, emphasizing how both aspects influence lending decisions.

Eliwa et al. (2021) and Cheng et al. (2013) suggest direct financial benefits from enhanced ESG performance. However, Chen and Xie emphasize the role of investor preferences, implying that the financial benefits may be contingent upon investor attitudes towards ESG.

4. Conclusions

According to the data, ESG research will continue to develop because of new reporting frameworks and the increasing pressure from stakeholders for robust and transparent disclosures. This evolution indicates that since the field advanced, the academics' attention in the practice of ESG has now shifted towards an investigation of the interrelation of ESG mechanisms on business practices and their functioning within them, taking into consideration the issues of accountability and transparency in corporations (Sustainable Finance Disclosure Regulation [SFDR], 2021).

The development of the field of knowledge about ESG research and its application will remain a key area of interest including its qualitative and quantitative aspects concerning the reporting, governance and performance of firms.

Researchers emphasized quality and accountability in reporting, preparing the way for a more structured approach to ESG disclosure.

Therefore, as research developed, the importance of the themes covered in this article have been critical in forecasting on what ESG practice as well as research will focus in the future.

In conclusion, this analysis illustrates a field that has moved from basic reporting to a comprehensive, impactful framework designed to support sustainable corporate behaviour and stakeholder trust. The emphasis on transparency, accountability, and comparability aligns with global efforts to standardize ESG practices. However, the persistence of themes related to management indicates ongoing challenges in achieving transparent and honest reporting. As ESG research continues to mature, the focus on standardization, transparency, and impact measurement will remain central for scholars and researchers.

In this connection, other roles will be included, providing future research direction, which could include exploring the long-term effects of regulatory changes, the costs and benefits of ESG compliance, and ESG rating and ranking.

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SUSTAINABLE BUSINESS MODELS IN THE FASHION INDUSTRY: BETWEEN INNOVATION AND SOCIAL RESPONSIBILITY

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Abstract: *Sustainability, the circular economy, and sustainable development are terms that have become increasingly prevalent in recent years, used by policymakers, the business environment, and individual consumers alike, due to the impact of these concerns on the more efficient use of resources, quality of life, and the benefits they bring to humanity both in the short and long term. Sustainability in the fashion industry has become an increasingly discussed topic in contemporary times, as consumers grow more aware of the environmental impact of clothing and of the responsibility to protect nature and limited resources. The objective of this paper is to investigate the extent to which sustainability reporting by key actors in the fashion industry reflects the genuine integration of sustainable development principles into their business strategies. The research is guided by the following research question: to what extent do sustainability practices and communication indicate an authentic transition toward a responsible business model, or, conversely, reproduce forms of superficial sustainability primarily oriented toward reputation management? The paper adopts a qualitative, theoretical–empirical approach, based on a comparative analysis of official sustainability reports published by selected companies in the fashion industry. This analysis is supported by a conceptual framework integrating academic literature on sustainability, corporate social responsibility, greenwashing, and international reporting standards. The methodology consists of a content analysis aimed at identifying and comparing the core elements of sustainability discourse within each company, with particular emphasis on the coherence of objectives, transparency of indicators, alignment with global initiatives (such as the SDGs or GRI), and the depth of implemented measures. The case study highlights similarities in the language used and the general commitments declared, while also revealing significant differences in terms of clarity, applicability, and the actual impact of these initiatives. The research findings provide a critical perspective on how companies use sustainability reporting both as a strategic tool and as a means of legitimization in the eyes of consumers and investors. The conclusions suggest the need for stricter reporting standards and independent monitoring of progress, while also emphasizing the importance of consumers' critical literacy in evaluating the sustainability commitments promoted by fashion industry brands.*

Keywords: Sustainability; Fashion Industry; Financial and Social Responsibility; Financial Reporting; Sustainable Business

JEL Classification: L67; F14; Q01; M00

1. Introduction

In a world with limited natural resources and increasing pressure on ecosystems, the adoption of a circular economic model and sustainable private, public, and organizational behaviors has become an urgent necessity.

Every sector of the national and global economy contributes, to varying degrees, to economic growth; however, industries differ significantly in their levels of resource consumption and waste generation. The textile and fashion industry occupies a leading position in terms of resource use (materials, energy, and water) and waste generation, both during the production phase and in the pre-consumption and post-consumption stages (Shamsuzzaman et al., 2025; Niinimäki et al., 2020). Historically characterized by a linear “take–make–dispose” model, the industry exerts intensified pressure on natural resources and is responsible for a significant share of global greenhouse gas emissions, water pollution, and textile waste generation.

Within this disruptive context, the integration of the United Nations Sustainable Development Goals (SDGs) and Environmental, Social, and Governance (ESG) criteria has become not only an ethical requirement but also a new framework for corporate legitimacy. This paper positions itself at the intersection of strategic management and corporate social responsibility, examining how key market actors—segmented by business models (Luxury, Mass Market, Fast Fashion, and Ultra-Fast Fashion)—respond to sustainability challenges.

Sustainability in the fashion industry has become an increasingly prominent concept in public discourse. However, sustainability in this sector extends beyond circular economy practices, recycling, eco-design, and the use of environmentally friendly materials. It also involves changes in consumer behavior, shifts in perceptions regarding environmental responsibility, and the development of broader environmental awareness. Education, behavioral psychology, innovation, and social responsibility play a crucial role in driving this paradigm shift.

The environmental impact of the textile and fashion industry is well documented in both statistical research and academic literature (Gazzola et al., 2020; Gupta et al., 2022; Shamsuzzaman et al., 2023). Annually, over 100–150 billion garments are produced worldwide, consuming approximately 93 billion cubic meters of water, generating around 1.2 billion tons of CO₂ emissions, and releasing an estimated 500,000 tons of fibers and microplastics into the oceans. Of the total volume of clothing produced globally, approximately 92 million tons of textile waste accumulate at various stages of the product life cycle. Only 15–20% of this waste is collected for recycling or reuse, while nearly 80% ends up in landfills or is incinerated, resulting in energy and raw material losses and contributing to an increased carbon footprint.

2. Literature review

The review of the specialized literature must address several objectives, including the evaluation of existing academic research within the chosen field of study, the synthesis of identified information, critical analysis, and the structured organization of the collected sources. As a first step, a preliminary analysis was conducted using the Web of Science (WoS) database, focusing on the keywords relevant to this study. To narrow the search to the domains of interest, the WoS query included keywords

associated with sustainability in the fashion industry. Based on the objective of evaluating the literature indexed in the Web of Science database, the search using keywords such as sustainability, circular economy, social responsibility, and the fashion industry resulted in the identification of over 393,000 sources. Of these, more than 304,500 were journal articles, with 177,702 classified as open-access publications.

Regarding the year of publication, WoS data indicate a sharp increase in academic interest in this topic. In 2010, 6,919 publications were recorded; by 2015, this number had doubled. In 2020, the number of publications exceeded 29,000. After 2020, interest in sustainability within the fashion industry intensified significantly, reaching 41,514 published titles in 2023 and 55,369 in 2024. In the first four months of 2025 alone, more than 24,000 publications addressing this topic were already recorded. Using VOSviewer, the map of keyword co-occurrence reveals several distinct clusters. Keyword associations are grouped by color, with each color representing a dominant term. The most frequently researched terms appear as central nodes, indicating that the majority of articles focus on keywords such as circular economy, sustainability, management, performance, and innovation.

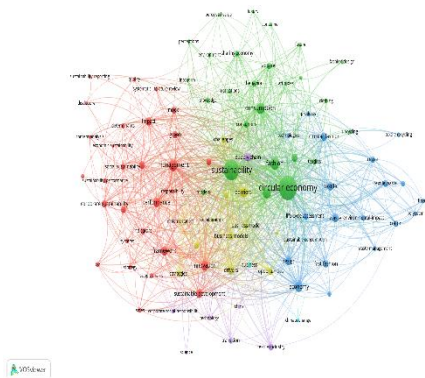


Figure 1. Keyword co-occurrence network on sustainability in the fashion industry (VOSviewer cluster visualization)

Source: Author's own elaboration based on Web of Science data, processed using VOSviewer

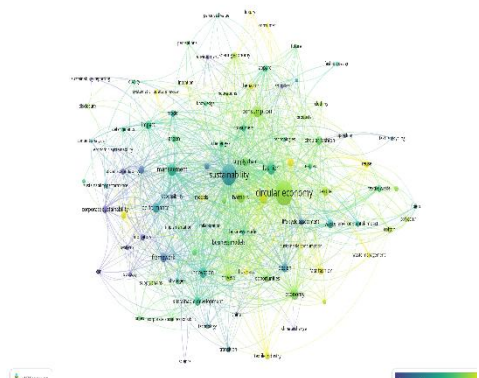


Figure 2. Temporal evolution of keywords on sustainability in the fashion industry (VOSviewer overlay visualization)

Source: Author's own elaboration based on Web of Science data, processed using VOSviewer

From a cluster perspective, the most clearly defined area is represented by the green cluster, with circular economy and sustainability as dominant nodes and associated terms such as environment, behavior, challenges, consumption, and future. A second strongly delineated cluster centers around management, with associated keywords including performance, innovation, sustainable development, and responsibility. The analysis also shows strong interconnections between keyword

clusters; the stronger the relationship between groups, the more prominent the connecting lines. In terms of terminology usage over time, the literature shows a clear evolution: early studies primarily employed the concept of reuse within the fashion industry, followed by the consolidation of the circular economy framework, and more recently, the widespread adoption of the broader concept of sustainability (Figure 2).

An analysis of authors by country of origin shows that during the 2020–2021 period, the largest number of authors came from the United Kingdom, the United States, Germany, Canada, Brazil, and Australia. In more recent years, a noticeable increase in the number of authors addressing this topic can be observed in countries such as Italy, China, Spain, and India. The following figure also indicates that Romania is increasingly represented by researchers concerned with sustainability and the circular economy, despite the fact that Romanian legislation did not mandate the preparation of sustainability reports for economic entities during the analyzed period. This reporting obligation will only come into force starting with the 2025 financial year. Nevertheless, economic entities were allowed and encouraged to voluntarily disclose information regarding environmental protection activities, social responsibility, and sustainability.

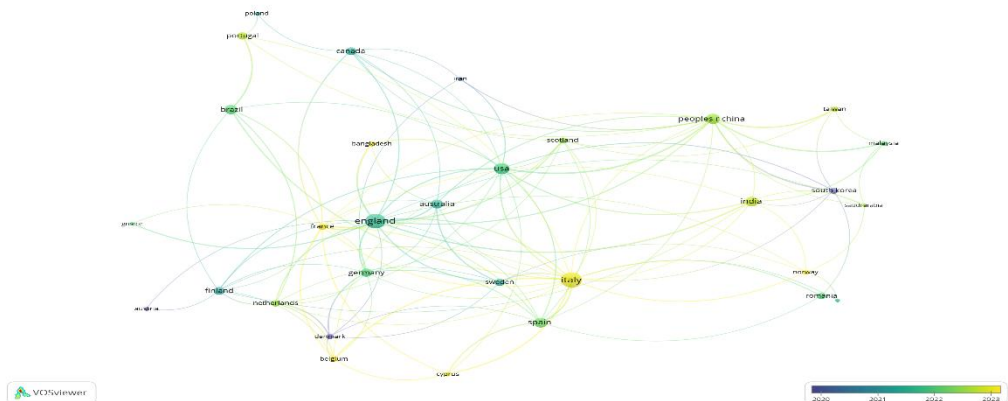


Figure 3. International collaboration network of authors in sustainability and circular economy research within the fashion industry (VOSviewer overlay visualization
Source: Author's own elaboration based on Web of Science data, processed using VOSviewer

The question therefore arises as to why there is such a high level of interest in circular economy and sustainability within the fashion industry. The answer lies in the fact that, as previously mentioned, the fashion industry makes a substantial contribution to global warming and environmental degradation through chemical pollution and CO₂ emissions (Pal & Gander, 2018; Niinimäki et al., 2020; Turker & Altuntas, 2014; Papasolomou et al., 2023). While early research highlighted a perceived incompatibility between competitiveness and sustainability objectives (Almeida et al., 2017), more recent studies increasingly examine and confirm the existence of a positive relationship between these two goals (Ikram et al., 2019; Ishara & Mekara, 2023).

The concept of sustainability refers to the ability of human activities to be carried out without depleting resources or harming the environment, thereby preserving the capacity of future generations to meet their own needs. The World Conference on the Environment held in Rio de Janeiro in 1994 placed particular emphasis on this concept, highlighting the need to balance economic growth, environmental protection, and the identification of alternative resources.

Within this context, it is essential to analyze the extent to which entities and decision-makers in the fashion industry strive to achieve a balance between economic growth and sustainability, circular economy principles, innovation, and sustainable development (Giannetti et al., 2023; Zhang et al., 2021; Oncioiu et al., 2018; Iuraș et al., 2024; Ostermann et al., 2021; Huynh, 2022; Coscieme et al., 2024), as well as the harmonious integration of the three core dimensions of sustainability: economic, environmental, and social (Rossi et al., 2020, Almeida et al 2017). The literature also emphasizes the strong connection between sustainability and corporate social responsibility in the context of Industry 4.0 (Bogdan et al., 2025; Thorisdottir & Johannsdottir, 2020; Battaglia et al., 2014; Chan et al., 2020; Nguyen et al., 2021).

In academic literature, sustainability is sometimes conflated with resilience and sustainable development; however, it is widely acknowledged that these concepts are closely interconnected. Resilience can be viewed as a component of sustainability, sustainability as a component of resilience, or resilience and sustainability as distinct but complementary objectives (Marchese et al., 2018; Giannetti B. et al., 2023; Mathew & Spinelli, 2025). Sustainable development represents a broader concept encompassing economic, social, and environmental sustainability (Ishara & Mekara, 2023; Dainelli et al., 2024).

Furthermore, several authors address the role of eco-innovation in the fashion industry and its impact on improving firms' economic performance (Hojnik et al., 2018; Dainelli et al., 2024; Mac Lennan et al., 2023; Rahaman, 2025; Bogdan et al., 2025).

3. Research Methodology

Starting from the importance attributed by all economic actors to the Sustainable Development Goals (SDGs) and ESG reporting, this study seeks to examine whether entities in the fashion industry pay attention to these objectives, how they have integrated them into their activities, and whether—and to what extent—they emphasize reporting based on the three pillars of Environmental, Social, and Governance.

While it is widely acknowledged that major luxury and premium fashion brands place greater emphasis on these aspects, this research aims to analyze the extent to which entities operating in the sportswear, retail, fast fashion, and even ultra-fast fashion segments align with the Sustainable Development Goals and how these objectives are incorporated into their business models.

The present research adopts a mixed qualitative–quantitative and analytical approach, with the objective of evaluating the foundation upon which societal trust is built regarding the commitment of global fashion industry entities to the

Sustainable Development Goals, as well as assessing the maturity level of their sustainability strategies.

This study employs a research design based on comparative content analysis. The primary methodological objective is to move beyond the simple aggregation of reported data by establishing a strategic evaluation and analytical framework that enables a critical classification of how fashion corporations integrate Sustainable Development Goals into their sustainability reports and align sustainability objectives with their operational models.

The methodology was structured into three main stages: the selection and collection of the document sample, the systematic coding of content based on the SDGs, and thematic synthesis combined with the application of a critical analytical framework.

The study sample consists of 16 major brands and/or corporate groups within the fashion industry. These entities were selected based on their global representativeness (United States, Europe, Asia), global relevance, market volume, involvement in social and environmental issues, and diversity of business models. The sample was subsequently grouped into three strategic segments: Luxury/Premium, Mass Market, and Fast Fashion–Ultra-Fast Fashion.

Table 1. Fashion Industry Entities Analyzed

<i>No.</i>	<i>Company / Group</i>	<i>Segment</i>	<i>Source Document Used</i>
1.	Hugo Boss	Luxury/Premium	HUGO-BOSS-Sustainability-Report-2023.pdf
2.	LVMH Group	Luxury	LVMH Moët Hennessy Louis Vuitton 2023...pdf
3.	Hermes	Luxury	HERMES 2023_csr_extract_en_mel.pdf
4.	Capri Holdings	Luxury	Dec-12 2024 Capri.pdf
5.	Marc&Jacobs	Luxury/Premium	MARC JACOBS-esg-disclosures-update_pdf
6.	Zimmermann	Luxury	Zimmermann_Sustainability_Report_2024.pdf
7.	Ralph Lauren	Premium/Lifestyle	Ralph Lauren-2023-GCSReport.pdf
8.	Li-Ning	Sportswear	LI-NING csr_report_2023 LI-NING China.pdf
9.	Bosideng	Sportswear	Bosideng 300340-e_her24070002_e_bosideng_esg_ar24...pdf

10.	Marks & Spencer	Mass Market/Retail General	Mark&Spencer sustainability-report-2023.pdf
11.	H&M Group	Fast Fashion	HM-Group-Annual-and-Sustainability-Report-2023.pdf
12.	C&A	Fast Fashion	c&a raport sustenabilitate.pdf
13.	GAP Inc.	Fast Fashion	GAP 2023-gap-inc-esg-report.pdf
14.	Inditex	Fast Fashion	Inditex Sustainabilityreport2023.pdf Inditex
15.	Uniqlo	Fast Fashion	Uniqlo sustainability report 2023 Japonia.pdf
16.	Shein	Ultra Fast Fashion	SHEIN-2023-Sustainability-and-Social-Impact-Report.pdf.pdf

Source: Authors' analysis based on official Sustainability, ESG, CSR, and Annual Reports published by the analyzed companies (2023–2024)

The primary data source consisted of Corporate Sustainability Reports, Integrated Annual Reports, and ESG Strategic Plans published by the entities included in the sample. Data extraction focused on the most recent available reporting cycles, with particular emphasis on information corresponding to the 2023 fiscal year.

All strategies and objectives identified in the analyzed reports were systematically coded into a comparative matrix, using each of the 17 Sustainable Development Goals (SDGs) as the unit of analysis. A binary coding system (Presence/Absence) was applied, complemented by a qualitative description of the reported actions.

The credibility of the findings was ensured through the exclusive use of publicly available corporate documents (official reports), thereby guaranteeing that the extracted data reflect the entities' publicly stated commitments. Reliability was ensured by applying a standardized coding framework based on the 17 SDGs across the entire sample, thus reducing subjectivity in data interpretation.

The analysis of sustainability performance (ESG – Environmental, Social, Governance) among companies in the fashion and retail sector reveals significant divergence in how these entities manage their environmental and social impacts.

To quantify the maturity level of sustainability strategies, an ordinal ESG performance assessment scale (Environmental, Social, Governance) was applied. The scale ranged from 1 to 5, where:

- Score 1 indicates the complete absence of ESG policies (high reputational risk);
- Score 2 indicates low transparency and fragmented reporting;
- Score 3 indicates moderate engagement and limited actions;
- Score 4 indicates solid policies with certain shortcomings;
- Score 5 indicates full strategic integration and compliance with global sustainability standards.

4. Discussion and Analysis of Results

The empirical data are presented in the Sustainability Matrix (Table 2), interpreting the distribution of the analyzed entities' commitments to the SDGs based on market segment.

Table 2. Sustainability Matrix of Adopted SDGs

No	Company	SDG Number																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1.	Hugo Boss	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
2.	LVMH Group	A	A	P	P	P	P	P	P	P	P	P	P	P	P	P	A	P
3.	Hermes	A	A	A	P	A	P	P	A	A	P	P	P	P	A	P	A	P
4.	Capri Holdings	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
5.	Marc&Jacobs	A	A	P	A	P	P	P	A	P	P	P	A	P	P	P	A	A
6.	Zimmermann	A	A	P	A	P	P	A	P	P	P	A	P	A	P	P	A	P
7.	Ralph Lauren	P	A	P	P	P	A	P	P	A	P	A	P	P	A	A	A	P
8.	Li-Ning	P	P	P	P	P	P	P	P	P	P	P	P	P	A	P	P	P
9.	Bosideng	P	A	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
10.	Marks&Spencer	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
11.	H&M Group	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
12.	C&A	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
13.	GAP Inc.	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
14.	Inditex	P	A	P	P	P	A	A	P	A	P	A	P	P	A	A	A	P
15.	Uniqlo	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
16.	Shein	A	A	A	A	P	P	P	P	A	A	A	P	P	A	P	A	P

Source: Authors' own processing based on data extracted from sustainability reports

4.1. Analysis of Convergences in Relation to the SDGs

The analysis of the Sustainability Matrix highlights a set of SDGs that have reached the status of quasi-mandatory standards across all market segments, indicating what

can be described as the baseline of corporate legitimacy—the foundation upon which public trust in companies is built.

SDG 8 – Decent Work and Economic Growth and SDG 3 – Good Health and Well-being are almost universally addressed. Out of the 16 companies analyzed, 15 report engagement with SDG 8, while 13 address SDG 3, reflecting a uniform focus on occupational health and well-being. This convergence suggests that supply chain risk management and basic ethical standards are no longer competitive differentiators, but minimum requirements for global operations. The implementation of SDG 8 is frequently carried out through collaboration with the Fair Labor Association, which aims to promote labor rights and improve working conditions in global supply chains based on international labor standards. This indicates the existence of a multi-stakeholder partnership involving companies, civil society organizations (NGOs), and academic institutions working together to address complex social issues within supply chains.

Addressed by 15 companies, SDG 17 – Partnerships for the Goals underscores the importance of industry-wide collaboration, particularly through initiatives such as Zero Discharge of Hazardous Chemicals (ZDHC). The primary objective of this initiative is to eliminate hazardous chemicals from the global fashion supply chain and to promote safer and more sustainable chemical management in order to achieve complex sustainability goals. This finding suggests that competing brands are capable of cooperating to address systemic environmental challenges that exceed the individual capacity of any single company.

Conversely, the Sustainability Matrix reveals the existence of so-called “gap SDGs”—goals that do not align with the direct business logic of most companies and are therefore treated as external vulnerabilities or addressed primarily through philanthropic actions. These gap SDGs provide strong evidence of the relative nature of corporate responsibility toward the SDGs. SDG 2 – Zero Hunger is addressed by only two companies (Uniqlo and Li-Ning), confirming that direct humanitarian goals tend to be subordinated to indirect efforts (such as wage increases under SDG 8) or charitable initiatives. Another gap SDG is Life Below Water (SDG 14), addressed by only five companies (Bosideng, LVMH Group, Marc Jacobs, Uniqlo, and Zimmermann). The lack of engagement by the remaining 11 companies indicates that microplastic pollution and ocean management are not yet fully integrated as material risks within many corporate strategies, often being treated as secondary effects of SDG 6 (Clean Water) or SDG 12 (Responsible Consumption and Packaging). SDG 1 – No Poverty represents another gap objective, addressed by only six companies. Although closely linked to SDG 8, most companies do not explicitly declare it as a primary strategic objective.

It is also important to note the interdependencies among certain Sustainable Development Goals. Although SDG 4 – Quality Education is adopted by 13 of the 16 analyzed companies, indicating a focus on skills development and highly qualified human capital, only five companies explicitly recognize a critical interdependence between two seemingly distinct goals: Education (SDG 4) and Life on Land – Biodiversity (SDG 15). This does not imply a conflict between the two objectives; rather, they represent the two essential ends of the leverage required for genuine paradigm change. By committing to SDG 15, companies acknowledge what must be protected—nature and natural capital—while linking it to SDG 4 highlights what must

be transformed: cognitive systems, mindsets, and knowledge structures. Together, these dimensions point toward the ultimate objective of a healthy planet and a responsible society.

4.2. Analysis of Sustainability Performance

ESG criteria (Environmental, Social, Governance) represent an integrated framework used to assess corporate sustainability and systemic risks. They reflect how organizations manage their environmental impact, social relationships, and governance practices. With regard to sustainability performance (ESG), the situation is presented in Table 3.

Table 3. ESG Performance

No.	Company	Environmental	Social	Governance	Overall Score
1.	Hugo Boss	5	5	5	5
2.	LVMH Group	3	3	3	3
3.	Hermes	4	3	4	3,7
4.	Capri Holdings	3	3	3	3
5.	Marc&Jacobs	2	2	2	2
6.	Zimmermann	2	2	2	2
7.	Ralph Lauren	4	4	4	4
8.	Li-Ning	2	2	2	2
9.	Bosideng	4	3	4	3,7
10.	Marks&Spencer	3	3	3	3
11.	H&M Group	4	4	4	4
12.	C&A	3	3	3	3
13.	GAP Inc.	4	4	4	4
14.	Inditex	3	3	3	3
15.	Uniqlo	3	3	3	3
16.	Shein	2	2	2	2

Source: Authors' own assessment based on data extracted from corporate Sustainability, ESG, and Integrated Annual Reports

The analysis of sustainability performance (ESG – Environmental, Social, Governance) among companies in the fashion sector reveals significant divergence in how these entities manage their environmental and societal impacts. The overall ESG score, assessed on a scale from 1 to 5, ranges from an exemplary level of 5.0 to a concerning minimum of 2.0. This disparity highlights the importance of heterogeneity in the adoption and implementation of sustainability strategies.

A benchmark performer within the sample is Hugo Boss, which achieves the maximum score of 5.0 across all three pillars (Environmental, Social, and Governance). This performance suggests a robust and mature integration of sustainability principles throughout its operations, establishing a reference point for other companies. Additionally, within the top performance tier, companies such as Ralph Lauren, Gap Inc., H&M, Bosideng, and Hermès demonstrate solid

performance, with overall scores of 4.0 and approximately 3.7, indicating strong commitments and partially successful implementation.

At the opposite end of the spectrum, several companies face elevated ESG risks, recording overall scores of 2.0. These include Li-Ning, Marc Jacobs, and Zimmermann. Such low scores signal critical deficiencies, particularly with respect to the Social and Governance pillars. For instance, Shein records a score of only 2.0 in both the Environmental and Social dimensions, highlighting potential issues related to supply chain transparency and labor conditions.

A pillar-specific comparison reveals the following patterns:

- Social pillar (S): Significant vulnerability is observed across multiple companies, with scores of 2.0 recorded by Shein, Li-Ning, and Zimmermann. This indicates the need for stronger efforts in protecting workers' rights, ensuring occupational health and safety, and improving ethical workforce management.
- Environmental pillar (E): Despite the presence of leaders such as Hugo Boss (score of 5.0), the average environmental performance is negatively affected by companies including Li-Ning, Marc Jacobs, Zimmermann, and Shein, all of which score 2.0. This suggests that operational environmental impacts—such as emissions, pollution, and resource consumption—remain major challenges.
- Governance pillar (G): Governance scores vary across the sample; however, companies such as Marc Jacobs, Li-Ning, Zimmermann, and Shein, which score 2.0, may require improvements in areas related to ethics, reporting transparency, and managerial structures.

5. Conclusions

This study examined the sustainability performance (SDGs and ESG) of companies operating in the fashion sector, demonstrating that commitment to responsibility is defined by a heterogeneous strategic divergence that goes beyond mere regulatory compliance. The analysis confirms that sustainability represents a fragmented landscape, dominated by a triple dichotomy shaped by business model characteristics.

Overall, the findings indicate that the transition toward a sustainable model in the fashion industry is far from uniform. The notable performance of companies such as Uniqlo and Li-Ning in terms of adopting a large number of Sustainable Development Goals (17 and 16, respectively), alongside relatively modest ESG scores (3 and 2, respectively), demonstrates that the mere presence of an SDG does not indicate the quality or effectiveness of its integration into a company's core strategy. While many SDGs are formally addressed, the disclosed information is often incomplete, unaudited, difficult to verify, or superficially implemented, with limited integration into core operations and strategic decision-making processes—reflecting a lack of systemic rigor. The true leader is therefore not the company that “checks” the largest number of SDGs, but the one that moves beyond passive compliance toward relative responsibility and aligns its objectives in pursuit of absolute social responsibility.

The analysis of sustainability maturity confirms that high-quality ESG practices are achievable, while low ESG scores highlight critical areas where increased investment and stronger regulation are required to align the industry with the Sustainable Development Goals.

The ESG findings generate important implications for both management and regulation. Companies positioned in the lower performance tier must prioritize deficiencies related to Governance (G) and Social (S) dimensions, which cannot be offset by cosmetic improvements in Environmental performance. Reporting transparency and ethical workforce management are essential for long-term stability and legitimacy.

At the same time, regulatory institutions and investors should not rely exclusively on relative improvements—such as reductions in emission intensity—but should instead demand evidence of absolute social responsibility, namely the decoupling of value creation from physical environmental impact. Benchmark models such as Hugo Boss (ESG score of 5.0) demonstrate that top-tier ESG performance is compatible with economic success, thereby establishing a replicable model for the wider industry.

This study contributes to the existing literature in several key ways: a. Validation of ESG Performance Heterogeneity: Global ESG scores ranging from 5.0 (Hugo Boss) to 2.0 (Li-Ning, Marc Jacobs, Zimmermann, Shein) confirm the absence of a single industry-wide standard and highlight substantial disparities in ESG maturity. Hugo Boss, with an exemplary score of 5.0 across all three pillars, establishes a benchmark that demonstrates the feasibility of robust ESG integration. b. Identification of Systemic Vulnerabilities: Pillar-level analysis confirms that the Social (S) and Governance (G) dimensions represent critical vulnerabilities for high-risk companies (scores of 2.0 for Li-Ning, Shein, Zimmermann, and Marc Jacobs). This suggests insufficient focus on ethical workforce management and supply chain transparency—areas essential to sectoral legitimacy.

In conclusion, the sustainable future of the fashion industry depends on companies' ability to move from reactive risk management toward deep strategic integration, aligning SDGs and ESG excellence with their core business models.

Promoting a more just, equitable, and sustainable future for all countries and populations depends on cleaner and more responsible production and sustainable development. By pursuing these objectives, it is possible to improve both present conditions and long-term prospects for current and future generations.

The limitations of this study stem from the fact that the analysis of sustainable development indicators and ESG practices was conducted for a single reporting year, without assessing year-to-year dynamics. Additionally, sustainability practices were examined for a limited number of companies.

Future research directions include a longitudinal analysis of how mandatory sustainability legislation will reshape the distribution of SDGs within the Sustainability Matrix, as well as an empirical evaluation of the relationship between sustainability performance, financial performance, and market-based financial indicators.

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31. The sustainability reports of the 16 companies analyzed

IMPRESSION MANAGEMENT IN SPORTSWEAR BRANDS' ESG REPORTING: A COMPARATIVE ANALYSIS

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Abstract: *This paper investigates how companies construct their sustainability image and the extent to which this image reflects reality, focusing on the use of Impression Management (IM) strategies in ESG reporting. The analysis centers on five major brands in the sportswear industry—Nike, Adidas, Puma, New Balance, and Reebok—in a context shaped by new European Union and international reporting regulations (such as CSRD and IFRS S1/S2).*

The research adopts a qualitative-comparative method, based on textual and visual content analysis of sustainability reports and public ESG materials. The textual analysis explores the use of hyper-positive language, justifications, and information omissions, while the visual analysis examines how images, colors, and ecological symbols are employed to amplify the perception of sustainability. The results reveal significant differences in the intensity of IM: Nike and Reebok utilize IM at a high level, through aspirational narratives and intense visual symbolism; Adidas adopts a hybrid strategy, combining transparency with persuasive elements; and Puma and New Balance maintain a factual and more credible communication style. These findings highlight that ESG reports often function as narrative instruments, rather than solely technical documents, and that the intensity of IM reflects brand identity and strategic positioning. The paper contributes to understanding how companies manage public perceptions regarding sustainability and offers useful insights for policymakers concerned with the credibility and regulation of ESG reporting.

Keywords: *Impression Management; ESG Reporting; Corporate Sustainability; Greenwashing; Sportswear Industry*

JEL Classification: *M14; M41; Q56*

1. Introduction

Over the past two decades, corporate sustainability has emerged as a strategic pillar, cemented by social pressures and major reporting reforms. The implementation of the CSRD and the ESRS standards, applicable starting in 2024, introduces rigorous requirements based on double materiality, while globally, the IFRS S1 and S2 standards, alongside the GRI 2023 framework, seek to harmonize disclosure practices. Nevertheless, the literature shows that sustainability reporting remains heavily influenced by Impression Management techniques—the selective and favorable presentation of information, hyper-positive language, justifications, and

visual symbolism—which can distort the fidelity of communication (Merkl-Davies & Brennan, 2007; Cho et al., 2010).

The sportswear industry represents a relevant context for these dynamics, given its complex supply chains and the crucial role of brand identity in communication. Companies such as Nike, Adidas, Puma, New Balance, and Reebok annually publish extensive sustainability reports, yet the discursive style, message intentionality, and use of visuals differ considerably, indicating distinct IM practices. The research pursues a comparative analysis of these reports, aiming for three objectives: 1. identifying strategies of valorization, justification, and omission; 2. examining the symbolic and aesthetic mechanisms within the "green" narratives; and 3. evaluating the coherence between the discourse and the effectively reported ESG data.

The findings contribute to the literature on corporate communication by demonstrating that, despite strict regulations, ESG reporting remains a space where information and persuasion coexist, and Impression Management continues to play a central role in constructing organizational legitimacy.

2. Theoretical Framework

Understanding how companies construct their sustainability image in ESG reports requires a theoretical framework that combines psychosocial perspectives with current reporting requirements. ESG reports often function as persuasive instruments, as organizations employ Impression Management techniques in the selection of information, discourse, and visuals, even within the context of ESRS, IFRS S1/S2, and GRI 2023 standards. In this regard, this section explores the theoretical foundations of IM, the evolution of the global reporting framework, and how IM manifests in the narratives and aesthetics of ESG reports, establishing the basis for the subsequent comparative analysis.

2.1. Impression Management (IM) and Green Impression Management (GIM)

Impression Management explains how actors construct and project their image in social interactions (Goffman, 1959). In the organizational environment, companies apply these strategies through the selection of language, structuring of information, and the use of visual elements to influence stakeholder perceptions (Bolino et al., 2008). In sustainability reporting, these practices manifest as green impression management when organizations promote an ecological image that does not entirely reflect operational reality (Cho et al., 2010). Recent studies show a significantly more optimistic tone in sustainability reports compared to management documents, suggesting an impression management gap between message and content (Sneiderienė, 2025). Furthermore, visual elements—such as images of nature or positive scenes—are strategically used to generate favorable emotions and diminish the visibility of critical aspects (Kanbaty et al., 2024).

Impression management in ESG reporting manifests on two planes: linguistic and visual. At the linguistic level, companies use hyper-positive tone, superlatives, general commitments, justifications for poor performance, and omission of sensitive data to shape the narrative (Iazzi, 2025). At the visual level, images of nature or

positive scenes function as symbolism intended to generate favorable emotions and mitigate critical perceptions (Kanbaty et al., 2024). Recent research highlights a semantic gap between ESG reports and management reports, with the former adopting a considerably more optimistic tone, indicating deliberate impression management practices (Sneiderienė, 2025). Simultaneously, visual distortions amplify the perception of sustainability even when data is ambiguous. These mechanisms are explained by Legitimacy Theory and Signaling Theory, and the literature indicates that, although regulations like CSRD increase transparency, they do not completely eliminate the potential for discursive manipulation (Free & Jones, 2024).

2.2. The Sustainability Reporting Landscape in 2024–2025

Sustainability reporting is undergoing a major transition: In the European Union, the application of Directive (EU) 2022/2464 – CSRD mandates the ESRS standards (European Commission, 2023) for the 2024 financial year. Globally, the International Sustainability Standards Board (ISSB) launched the IFRS S1 and IFRS S2 standards, applicable from January 1, 2024 (IFRS Foundation, 2024). Concurrently, the study, "The move to mandatory reporting – Survey of Sustainability Reporting 2024," highlights the significant progress in the maturity of reports, but also the persistence of the risk of manipulation through presentation (KPMG, 2024).

Table 1: Comparison of the Sustainability Reporting Frameworks in 2024

Framework	Institution	Materiality	Applicability	Special note
ESRS (CSRD)	European Commission	double (financial + impact)	Large EU companies	Mandatory FY 2024
IFRS S1/S2	ISSB	financial	Globally listed	Effective from January 1, 2024
GRI	Global Reporting Initiative	impact	Global, voluntary	2023 Update

Source: Own adaptation based on the European Commission (2023), IFRS Foundation (2024), and KPMG (2024)

Table 1 highlights the main differences between the reporting frameworks utilized in 2024 — ESRS (CSRD), IFRS S1/S2, and GRI 2023. It can be observed that ESRS imposes the highest rigor and mandates double materiality (impact + financial), being compulsory for large EU companies. In contrast, IFRS S1/S2 focuses solely on financial materiality and has global applicability, while GRI 2023 remains a voluntary framework, centered on social and environmental impact. This diversity of standards leads to major differences in the reporting approach, level of detail, and degree of transparency among companies operating in different jurisdictions.

3. Research Methodology

The study methodology is based on a qualitative-comparative approach, framed within the interpretive paradigm, by analyzing sustainability reports as strategic artifacts influenced by Impression Management practices. The data sources include Sustainability Reports, Impact Reports, Annual Reports, and official online sources from the five selected companies, chosen for their relevance and timeliness. The analysis was conducted in three distinct stages: an exploratory reading phase, a systematic evaluation using a six-dimensional coding grid (selectivity, positivity, visual framing, strategic ambiguity, externalization, and greenwashing potential), and a final comparative analysis involving conceptual triangulation between the five companies. Complementary to this, the textual analysis tracked tactics of valorization, justification, and omission, while the visual analysis identified strategies of green framing and visual symbolism. All companies were assessed using a common grid, which was supplemented by a criterion evaluating the coherence between the narrative and the reported ESG data. This allowed for the detection of discrepancies between the optimistic tone and actual ESG performance. The final result consists of an interpretive index of the IM degree, without intending rigid quantification, thus preserving the qualitative richness of the data.

Table 2: Impression Management Coding Matrix

Category	Description	Indicators	Observable example
Valorization	Presenting performance as outstanding or remarkable	Terms such as "leader," "milestone," "progress"	„2024 marks a milestone in our sustainability journey”
Justification	Explaining failures or shortcomings via external factors	Phrases: "due to global challenges"	„Supply chain disruptions impacted targets
Omission	Lack of relevant or critical information	Absence of historical series / exclusion of Scope 3	Lack of details regarding transport emissions
Visual Symbolism	Use of "green" images or warm tones (Visual Framing)	Ratio of green images per page	Photographs of forests, smiles, recycling
Data-Narrative Coherence	Degree of fit between claims and figures	Consistency between ESG KPI and language	Discrepancy between positive tone and increase in emissions

Source: Adapted from Free & Jones (2024) and Sneiderienė (2025)

Table 2 synthesizes the conceptual framework used for Impression Management analysis, bringing together the four principal tactics—valorization, justification, omission, and visual symbolism—supplemented by the criterion of data-narrative

coherence. This grid enables an integrated comparison of the discourse and visual elements, highlighting both strongly persuasive strategies (Nike, Reebok) and more factual and prudent approaches (Puma, New Balance). The results confirm that ESG reports function as narrative and aesthetic mechanisms for shaping perception, sometimes independently of actual performance. To ensure the credibility of the analysis, the study employed triangulation, double coding, and verification of temporal consistency between the 2023 and 2024 reports, complemented by external benchmarks (KPMG, Deloitte, IFRS Foundation). These procedures solidify the internal validity and support the robustness of the conclusions regarding Impression Management strategies.

4. Comparative Analysis of Impression Management in the ESG Reports of Five Major Sportswear Companies

This section presents the comparative analysis of how the five major companies (Nike, Adidas, Puma, New Balance, and Reebok) utilize Impression Management strategies in their sustainability reports. Each company is individually analyzed in subsections 4.1–4.5, by examining the discourse tonality, data transparency, use of justifications, informational omissions, and the intensity of visual symbolism. Subsection 4.6 integrates these findings into a synthetic comparison, supported by graphical representations, to highlight common patterns and strategic differences among the brands. Together, these analyses provide the basis for the interpretations developed in Section 5.

4.1. Nike —Narrative Intensity, Strategic Ambiguity, and Eco-Symbolism

Nike represents the clearest example of the systematic use of Impression Management strategies in sustainability reporting. The company's discourse is dominated by aspirational language—"innovation," "transformation," "empowerment," "equity," "progress"—terms frequently repeated to project the image of an organization in continuous evolution. However, this hyper-positive tone is not supported by detailed operational explanations: objectives are vaguely formulated, and concrete indicators are missing or insufficiently contextualized. Controversies regarding working conditions and supplier auditing are presented summarily, in generic terms and without quantifiable data, indicating pronounced informational selectivity.

Visually, Nike intensively employs idealized images of athletes, natural environments, recycled materials, and stylized graphics, supported by color palettes associated with sustainability. These elements have a predominantly persuasive function, being rarely correlated with concrete ESG indicators. Furthermore, the company frequently uses mechanisms of responsibility externalization, attributing supply chain issues to "global complexities" or "systemic challenges."

Overall, Nike's communication strategy is characterized by a high level of Impression Management, marked by intense discursive valorization, abundant visual symbolism, and a narrative approach oriented towards favorable self-presentation.

4.2. Adidas —Balance Between Transparency and Narrative Branding

Adidas adopts a more balanced strategy, situated between factual communication and reputation-oriented discourse. Although it integrates elements specific to ESG

marketing, the company maintains a higher level of transparency than Nike. Reports include sections dedicated to operational challenges—the use of synthetic materials, difficulties with traceability, and issues in the supplier chain—addressed explicitly rather than just in marginal notes. Quantifiable indicators hold a central position, and Adidas consistently utilizes standards such as GRI and ESRS, which lends methodological credibility and clarity. Objectives are formulated concretely, accompanied by percentages, historical series, and mentions of methodology, which reduces ambiguity and allows for a more precise performance assessment.

Nevertheless, certain segments remain marked by promotional discourse: concepts like "circularity" or "sustainable design" are sometimes generalized and insufficiently detailed. Even so, compared to Nike, Adidas's communication relies less on visual symbolism and more on data, positioning the company in a zone of moderate Impression Management.

4.3. Puma — Technical Discourse and Visual Minimalism

Puma stands out through a narrative strategy predominantly oriented towards the technical dimension of reporting. The documents avoid emotional language and an aspirational tone, using concise, informative formulations centered on processes, results, and explicit limitations. The reports are well-structured, rich in indicators, and include methodological details, which reduces ambiguity and increases transparency. Visually, Puma adopts a minimalist aesthetic: few images, neutral chromatics, and the absence of persuasive graphic elements, signaling a priority for information, not influence. The company openly acknowledges difficulties related to materials, logistics, or supplier monitoring, which reinforces the perception of communicative honesty. Taken together, these elements position Puma as a brand with a low level of Impression Management, whose reports are factual, transparent, and minimally dependent on rhetoric.

4.4. New Balance — Factuality, Sobriety, and Operational Focus

New Balance adopts a predominantly factual tone, centered on processes, audits, and concrete initiatives, avoiding the narrative discourse or "ESG storytelling" characteristic of many large brands. The reports are concise, well-organized, and focused on verifiable information regarding the supply chain, worker protection, and compliance. The language is sober and lacks aspirational rhetoric, and the communication intent appears geared toward information rather than persuasion. Unlike Nike or Reebok, the company avoids expansive promises and does not utilize eco-visual symbolism, maintaining a discreet and technical presentation. Although informational selectivity cannot be entirely eliminated, the level of cosmetic enhancement is reduced, which places New Balance in a zone of minimal Impression Management, characterized by pragmatic transparency and a very reserved visual identity.

4.5. Reebok — Strong Eco-Narrative, Inconsistency Between Discourse and Data

Reebok adopts a narrative style similar to Nike's, characterized by a strong dependence on visual symbolism and an enthusiastic discourse about "eco" initiatives. The company promotes bio-materials, recycling processes, and sustainable innovations in an aspirational manner, yet many claims are vaguely formulated and lack the clear performance indicators or methodologies to support them. Reports include numerous images of nature, recycled materials, and athletes in "green" settings, but these visuals are rarely accompanied by solid data, which creates a visible discrepancy between the narrative and operational reality. ESG data is often fragmented or context-deprived, and this contrast indicates a high level of green impression management, where the aesthetics of sustainability functions as a substitute for transparency. Overall, Reebok projects a very positive image of its environmental performance, but does so through narrative and visual mechanisms that exceed the support offered by the reported data.

4.6. Comparative Synthesis of Impression Management Intensity

To synthesize the differences among companies and to offer a clear comparative perspective on the intensity of IM strategies, this section integrates two graphical representations obtained following the application of the analytical grid.

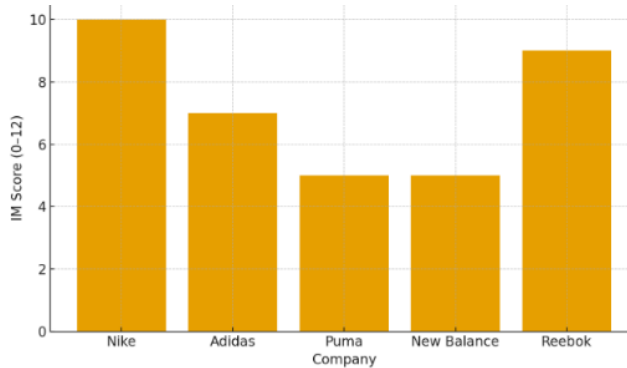


Figure 1. Total Impression Management Score for Each Company

Source: Own elaboration based on data resulting from the IM coding grid

Figure 1 provides a clear picture of the differences among the five companies regarding the intensity of Impression Management strategies. The chart highlights a distinct polarization: Nike and Reebok obtain the highest scores (10 and 9), confirming the intense use of aspirational discourse, visual symbolism, and externalization techniques observed in the qualitative analysis. Adidas positions itself at an intermediate level (7), reflecting a mixed strategy where narrative elements are balanced by operational indicators and the acknowledgement of limitations. At the opposite pole, Puma and New Balance register low scores (5), which indicates a factual communication style, with a neutral tone and minimal visual intervention. The bar chart not only synthesizes IM intensity but also reflects the

narrative logic of each brand: emphasis on storytelling and emotional branding for Nike and Reebok, and minimalism and technical orientation for Puma and New Balance, respectively. The graph thus confirms that the level of IM is closely linked to brand identity and the communication strategies adopted in the industry.

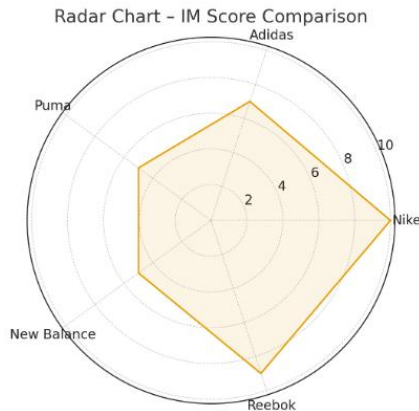


Figure 2: Comparative Company Profile

Source: Own elaboration, utilizing data resulting from the narrative and visual analysis (2025)

Figure 2 provides a complementary perspective on Impression Management strategies, highlighting not only their intensity but also their "shape" via a radar chart. Unlike the bar chart, which measures the total IM level, the radar chart shows the consistency and distribution of tactics across the various analyzed dimensions. Nike and Reebok exhibit broad and uniform shapes, indicating the simultaneous and systematic activation of all IM tactics—from informational selectivity to positive language and visual symbolism. In their case, IM functions as a strategy integrated into the narrative structure. Adidas has an intermediate profile, more extended than Puma and New Balance, but less pronounced than Nike and Reebok, reflecting the balance between transparency and reputational communication. Puma and New Balance are positioned close to the center of the diagram, with compact shapes that indicate a low use of IM and communication that is predominantly factual, visually minimal, and pragmatic. The radar chart thus highlights differences not only in intensity but also in style: a performative strategy (Nike/Reebok), a balanced approach (Adidas), and a technical, rhetoric-free orientation (Puma/New Balance).

5. Discussion

The comparative analysis confirms that Impression Management (IM) strategies are deeply embedded in the construction of ESG reports. The results, evidenced by the polarization in Figure 1 and Figure 2, provide compelling evidence supporting Legitimacy Theory: organizations under high scrutiny (Nike, Reebok) engage in intensive narrative and visual IM to safeguard their social contract, utilizing aspirational discourse and selectivity to project an image of progress even when underlying data falls short. This results in the IM Gap, confirming prior literature (e.g.,

Cho et al., 2010). Conversely, Puma and New Balance, relying on factual communication devoid of aesthetic excess, prioritize Signaling Theory to build credibility. Thus, the intensity of IM reflects both brand identity and the strategic calculus of managing legitimacy.

This study offers several significant implications. Theoretically, it extends the understanding of Green Impression Management (GIM) by integrating textual and visual analysis to develop a quantified interpretive index, demonstrating that GIM is a systematic, multimodal strategy rather than a random set of tactics. By contrasting "performative" narratives (Nike/Reebok) with "factual" narratives (Puma/New Balance), the study contributes to the debate on the effectiveness of non-financial disclosure in a regulated environment. On a practical and policy level, the results suggest that existing standards (ESRS, IFRS S2) designed to enforce quantifiable transparency do not adequately regulate the persuasive power of narrative and aesthetic components. This necessitates the development of stricter disclosure requirements for the narrative and visual components of ESG reports, as these areas remain highly vulnerable to manipulation and diminish the overall utility of the reports for stakeholders.

This study's limitations include its qualitative focus on a small sample (five major sportswear brands), which restricts generalizability across industries, and the interpretive IM index, which remains context-dependent. Consequently, future research should pursue a broader, longitudinal study examining IM intensity across multiple sectors following the full mandatory implementation of CSRD. Furthermore, future work could focus on testing the perceptual impact of visual symbolism on stakeholder confidence using experimental designs, linking the IM index directly to market reactions or investor decision-making.

6. Conclusions

The analysis of the five major sportswear companies demonstrates conclusively that Impression Management (IM) is a structural and systematic practice of modern sustainability reporting. The study's core finding is the existence of a clear polarization: while some brands prioritize fact-based and technical communication (Puma, New Balance), others rely on intensive, integrated IM strategies marked by aspirational language and visual symbolism (Nike, Reebok). This research confirms the distance between communicated performance and actual performance (the IM Gap), particularly for brands with highly packaged narratives. The discovery that the "aesthetics of sustainability" functions as a substitute for hard data highlights a critical regulatory blind spot. The findings underscore a pressing need for regulators to look beyond mere quantitative metrics and impose stricter governance on the narrative and aesthetic dimensions of corporate sustainability communication, ensuring that ESG reports are truly instruments of transparency and not tools for legitimacy negotiation.

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DIGITAL AUTOMATION AND PROFESSIONAL ROLE TRANSFORMATION IN CONTEMPORARY ACCOUNTING PRACTICE

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Abstract: *Automation and artificial intelligence are increasingly reshaping the accounting profession by redefining task structures, competence requirements and organizational arrangements. Although international research on accounting digitalization has expanded significantly, existing studies remain fragmented, often examining technological applications, professional skills or organizational factors in isolation. The purpose of this study is to address this gap by providing an integrated conceptual analysis of how automation and artificial intelligence jointly transform accounting tasks, professional competencies and role configurations within organizations. The study adopts a qualitative, conceptual research design based on the systematic analysis of peer-reviewed international literature indexed in Web of Science and Scopus, published between 2018 and 2025. Using a structured thematic synthesis, the analysis integrates insights from accounting information systems, auditing, management control and digital transformation research to identify recurring patterns and explanatory mechanisms. The findings indicate that automation extends beyond routine transaction processing and increasingly influences judgement-intensive activities, including anomaly detection, internal control evaluation, reporting quality and strategic analysis. The analysis further reveals that the impact of automation is mediated by digital competencies and organizational readiness, resulting in widening disparities between digitally mature organizations and those constrained by legacy systems, skill shortages and resistance to change. In parallel, the review highlights enabling conditions such as agile mindsets, continuous learning cultures and robust data governance frameworks. The contribution of this study lies in the development of an integrated socio-technical framework that consolidates fragmented international evidence and explains how automation reshapes accounting work through the interaction between technological infrastructure, professional competencies and organizational context. The findings offer implications for organizations navigating digital transformation and underscore the need for structured upskilling strategies, transparent algorithmic governance and alignment with emerging regulatory requirements.*

Keywords: *Automation; Accounting profession; Digital transformation; Artificial intelligence; Digital competencies; Cloud ERP systems*

JEL Classification: *M41; O33; M15; L86*

1. Introduction

Automation and artificial intelligence have become defining forces in the transformation of the accounting profession, reshaping not only operational

workflows but also the epistemic, cognitive and institutional foundations of professional judgement. Over the past decade, advances in cloud-based Enterprise Resource Planning systems, robotic process automation, machine learning, advanced analytics and generative artificial intelligence have converged to form a digitally embedded accounting environment in which professional practices are increasingly mediated by intelligent systems. Contemporary organizations rely on integrated digital platforms capable of real-time data processing, automated reconciliations, anomaly detection and predictive modelling, leading to substantial changes in how accountants generate, interpret and validate information. International research on digital transformation emphasizes that these developments represent more than incremental technological upgrades. Instead, they act as catalysts for structural reconfiguration in professional roles, competence requirements and organizational arrangements. Empirical studies indicate that digitalization alters the conditions under which accountants exercise professional judgement, interact with data and contribute to organizational decision-making processes. Topic modelling analyses of the accounting and artificial intelligence literature further reveal a growing scholarly focus on audit analytics, machine learning-based risk assessment, digital reporting infrastructures and continuous auditing systems. In parallel, research on cloud ERP adoption highlights the emergence of dialectical tensions between automation, standardization and real-time visibility on the one hand, and professional discretion, interpretive flexibility and contextual reasoning on the other. At the individual level, studies on digital literacy and professional skills development demonstrate that technological change requires more than technical proficiency. Agile mindsets, design thinking capabilities and the ability to interpret complex data flows increasingly shape professional effectiveness in digitally intensive environments. As automation absorbs routine and rule-based tasks and expands into cognitively demanding activities, accounting roles are progressively reoriented from procedural execution toward analytical reasoning, critical evaluation and oversight of algorithmic outputs. These transformations have significant implications for professional identity, autonomy and accountability. Despite the rapid growth of international research on accounting digitalization, the existing literature remains conceptually fragmented. Many studies focus on isolated technological components, such as cloud ERP systems, robotic process automation or analytics tools, without integrating these elements into a coherent socio-technical perspective. As a result, there is limited conceptual clarity regarding the mechanisms through which automation and artificial intelligence jointly reshape accounting tasks, professional competencies and role configurations within organizations. In particular, prior research seldom examines how technological infrastructures interact simultaneously with human expertise, organizational readiness and professional norms to reconfigure accounting work at the cognitive, organizational and institutional levels. Against this backdrop, the purpose of this study is to analyze, from an integrated conceptual perspective, how automation and artificial intelligence transform the structure of accounting tasks, professional competencies and the evolving role of accountants in contemporary practice. Specifically, the study synthesizes recent international research to identify the mechanisms through which emerging digital technologies such as robotic process automation, machine learning and cloud-based ERP systems reshape professional judgement, task allocation and

organizational expectations. The research objective is to develop an analytical framework that clarifies how automation modifies accounting tasks and decision processes, how digital competencies mediate professional effectiveness, and how organizational conditions shape readiness for AI-enabled transformation.

2. Literature Review

International research increasingly conceptualizes automation and artificial intelligence as transformative forces that reshape accounting work through the interaction between technological systems, professional competencies and organizational contexts. Early contributions framed automation primarily as a means of enhancing efficiency in routine accounting processes, such as transaction processing and reconciliations. More recent studies, however, demonstrate that intelligent technologies increasingly extend beyond routine task substitution and influence judgement-intensive activities, fundamentally altering the nature of accounting work (Kokina & Davenport, 2017; Bhimani, 2020). Empirical evidence shows that automation affects activities such as anomaly detection, internal control evaluation, continuous auditing and predictive reporting, requiring accountants to engage in validation, interpretation and supervision of algorithmic outputs rather than procedural execution (Richins et al., 2022). These findings suggest a reorientation of accounting roles toward analytical oversight and decision support. Despite this shift, much of the existing literature remains focused on task-level transformations and provides limited insight into how these changes translate into broader professional role reconfigurations.

A growing stream of research highlights digital competencies as a critical mediating factor shaping the impact of automation on accounting professionals. Studies consistently identify digital literacy, data analytics capabilities and proficiency in ERP environments as essential for effective performance in automated contexts (Scapens, R. & Jazayeri, M., 2022). At the same time, empirical evidence points to widening skill gaps driven by uneven access to training and heterogeneous levels of digital maturity across organizations, constraining professional adaptation to technological change.

Organizational context further conditions automation outcomes. Research on cloud-based ERP systems demonstrates that automation embeds new control logics and standardization mechanisms into accounting processes, generating tensions between efficiency, transparency and professional discretion (Ammar, 2025). These tensions highlight that automation outcomes are not technologically deterministic but depend on organizational readiness, governance structures and learning cultures.

Recent theoretical developments increasingly adopt the concept of hybrid intelligence to explain human-AI collaboration in professional settings. Rather than replacing professional judgement, intelligent systems complement human expertise by providing scalable analysis and pattern recognition, while accountants retain responsibility for contextual interpretation, ethical reasoning and accountability (Susskind & Susskind, 2022). This perspective challenges deterministic narratives of technological substitution and emphasizes the evolving nature of professional expertise in digitally mediated environments.

Taken together, the reviewed literature indicates that automation and artificial intelligence reshape accounting work through interconnected changes in task structures, professional competencies and organizational arrangements. However, existing studies predominantly examine these dimensions in isolation, resulting in a fragmented understanding of accounting digitalization. There remains a clear need for an integrated socio-technical perspective that explains how technological infrastructures, digital competencies and organizational readiness jointly reconfigure accounting roles and professional identity. Addressing this gap provides the foundation for the present study.

Based on the thematic synthesis of the international literature, the study develops an integrative conceptual model that summarizes the key mechanisms through which automation reshapes the accounting profession.

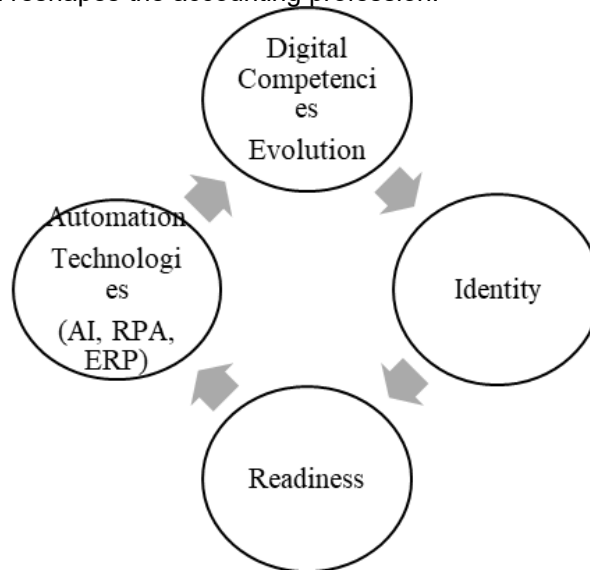


Figure 1: Conceptual Model of Automation and the Changing Role of Accountants

Source: Own elaboration based on information collected in the literature review

The model captures the dynamic interaction between automation technologies, the evolution of digital competencies, organizational readiness and professional identity, highlighting the recursive nature of accounting digitalization.

Theme	Description	Supporting Evidence
Automation of Routine Tasks	RPA, AI and ERP reduce repetitive tasks	Chen et al. (2024)
Shift Toward Analytical Roles	Accountants are becoming 'data navigators', shifting toward analysis, interpretation, and decision-making.	Terdpaopong, K., Visedsun, N. & Chotkunakitti, P. (2024)
Digital Competencies as Core Skills	Digital literacy, data modeling, and ERP proficiency are becoming mandatory competencies.	Enablers & Barriers Study (2023)

Hybrid Human-AI Collaboration	Professionals combine human judgment with AI outputs to achieve superior accuracy.	Oesterreich, T.D. & Teuteberg, F. (2019)
Cloud ERP Transformation	It introduces new institutional logics, creates role tensions, and changes process control.	Alsharari, N. M. (2020)
Ethical & Governance Challenges	Risks: bias, opacity, cybersecurity, technological dependence, weakened internal control.	EU AI Act (2024)
Identity and Professional Role Shift	Conflicts between the traditional role and the digital role; emergence of hybrid competencies	Digital Literacy & Agile Mindset Study (2024)
Organisational Readiness as a Moderator	The impact of automation depends on infrastructure, skills, culture, and digital leadership.	Umar, A. & Hasanah, U. (2024)

Table 1: Key Emerging Themes in Accounting Automation and Professional Transformation

Source: Own elaboration based on information collected in the literature review

These themes synthesis the core mechanisms identified in the literature and form the empirical and conceptual basis for the integrative model presented in Figure 1.

3. Research Methodology

This study adopts a conceptual, theory-building research design, consistent with the requirements of academic journals that emphasize analytical clarity and theoretical advancement in the context of technological change. The methodological approach does not aim to test hypotheses empirically, but to synthesize, integrate and reinterpret existing knowledge on automation and the evolving role of accountants within a coherent analytical framework. Accordingly, the study employs a structured conceptual synthesis, a method widely used in accounting, information systems and management research to consolidate fragmented insights, identify cross-disciplinary patterns and develop theoretically grounded propositions. Given the conceptual nature of the study, the data utilized in the analysis consist exclusively of peer-reviewed academic literature. The literature underlying the conceptual model was identified through a structured search process conducted across major academic databases, including Scopus, Web of Science, ScienceDirect, Emerald Insight and Wiley Online Library. The search strategy combined keywords such as automation, artificial intelligence, digital transformation, accounting profession, emerging technologies, cloud ERP, digital competencies, audit automation and controllers' skills. To ensure academic relevance and quality, only peer-reviewed journal articles were considered. Publications indexed as Q1 and Q2 according to the Scimago Journal Rankings were prioritized, while high-quality Q3 studies offering significant conceptual contributions were included where relevant. The selection process followed explicit inclusion criteria. Eligible studies examined automation, artificial intelligence or digital technologies within accounting, auditing or controlling; provided empirical findings or conceptual insights related to changes in professional roles, competencies or work processes; addressed organizational, cognitive, behavioural

or institutional implications of digital transformation; and were published between 2018 and 2025, a period characterized by accelerated technological adoption in the accounting profession. Exclusion criteria eliminated sources that were purely technical, focused exclusively on IT systems without implications for accounting practice, or descriptive reports lacking theoretical grounding. In addition, several foundational works published prior to this period were consulted where necessary to ensure conceptual continuity. Methodologically, the analysis was conducted using a multi-stage thematic synthesis approach. In the first stage, the selected articles were read in full and manually coded according to recurring conceptual anchors, including task automation, digital competencies, emerging technologies, cloud ERP transformations, organizational enablers and barriers, psychological effects and hybrid human-AI collaboration. In the second stage, these codes were clustered into higher-order themes reflecting the structural forces reshaping the accounting profession. Comparative analysis enabled the identification of tensions across studies, such as discrepancies between technological potential and actual adoption, variations in digital literacy, and divergent interpretations of artificial intelligence's impact on professional autonomy and judgement. In the final stage, the thematic patterns were integrated into a coherent conceptual framework explaining how automation reshapes accountants' roles, skills and professional identity. This structured methodological approach ensures transparency, analytical rigour and theoretical robustness, allowing the study to articulate an integrated interpretation of technological change grounded in the most relevant empirical evidence and conceptual advances in contemporary accounting research.

4. Results and Discussion

4.1. Synthesis of Key Findings

The findings presented in this section derive from the multi-stage thematic synthesis described in the methodology. Through iterative coding and comparative analysis of the selected international literature, recurring patterns related to task transformation, digital competencies, organizational readiness and professional identity were identified and consolidated into higher-order themes. These themes constitute the analytical basis for the synthesis presented below. The analysis of contemporary international research indicates that automation and artificial intelligence are reshaping the accounting profession through a multidimensional transformation affecting task structures, competence requirements, professional identity and organizational arrangements. This overarching finding is consistent with prior international studies documenting the expanding scope of automation in accounting beyond routine transaction processing (Kokina & Davenport, 2017; Bhimani & Bromwich, 2023). Evidence drawn from cloud ERP research, digital transformation studies, behavioural accounting analyses and technology adoption models converges around several recurring patterns. The synthesis reveals that automation increasingly extends into judgement-intensive domains, influencing activities such as analytical evaluation, anomaly detection, internal control assessment, continuous auditing and predictive reporting. International research similarly demonstrates that

machine learning and advanced analytics increasingly support, rather than merely replace, professional judgement in accounting and auditing contexts (Rozario, A.M. & Vasarhelyi, M.A., 2018). The analysis highlights widening skill gaps driven by insufficient digital literacy, heterogeneous levels of IT maturity and unequal access to structured upskilling opportunities. This pattern aligns with international empirical evidence identifying digital competencies as a critical mediating factor shaping accountants' ability to adapt to automation and extract value from advanced digital technologies (Rikhardsson, P. & Yigitbasioglu, O. 2018). The findings indicate that adoption barriers, including legacy infrastructures, organizational resistance, technostress and limited managerial support, continue to constrain the effective assimilation of automation technologies. As reported in comparable international studies, these barriers contribute to persistent discrepancies between technological potential and realized organizational outcomes within accounting functions (Moll, J., 2023). The synthesis identifies emerging trends such as hybrid human-AI collaboration, cloud ERP dialectics, algorithmic oversight roles and the growing use of advanced analytics as defining features of the future accounting landscape. These developments are consistent with international research emphasizing the reconfiguration of accountants' responsibilities toward supervisory, interpretive and governance-oriented roles in digitally intensive environments.

4.2. Critical Discussion

The integration of automation and artificial intelligence into accounting practice generates both significant opportunities and persistent structural tensions. On the one hand, intelligent systems enhance analytical capacity, accelerate reporting cycles, improve control effectiveness and enable real-time decision support. These benefits are widely documented in international research on automation and artificial intelligence adoption in accounting and auditing, particularly in digitally mature organizational contexts (Kokina & Davenport, 2017). On the other hand, the findings underscore a range of challenges associated with the increasing pervasiveness of automated systems. Automation may contribute to cognitive overload, ambiguity in role boundaries and a potential erosion of professional autonomy as decision processes become increasingly system-mediated. Similar concerns regarding autonomy loss, role ambiguity and reduced discretion have been highlighted in international behavioural accounting studies, especially within highly standardized and algorithm-driven environments (Bhimani & Willcocks, 2022). The analysis further indicates that automation amplifies existing organizational conditions rather than producing uniform outcomes. In organizations characterized by high levels of digital maturity, strong governance structures and continuous learning cultures, automation supports professional development and value creation. Conversely, in low-readiness contexts, digital technologies tend to exacerbate fragmentation, resistance and uneven performance outcomes. This finding is consistent with international evidence demonstrating that organizational digital maturity moderates the relationship between automation and professional role transformation (Pan, G. & Seow, P. S., 2016). Moreover, the growing reliance on AI-enabled analytics introduces new forms of dependency on algorithmic outputs, raising concerns related to automation bias and diminished professional skepticism. International studies on algorithmic

decision-making report comparable risks, suggesting that without adequate oversight mechanisms, professional judgement may be constrained rather than enhanced by intelligent systems. At the psychological level, the results suggest that continuous technological change may generate uncertainty, identity disruption and digital fatigue among accounting professionals. Such effects mirror findings from international research on technostress and digital work intensification in professional occupations (Appelbaum D., et al., 2017). Taken together, these findings indicate that the impact of automation on accounting practice is contingent upon the interaction between technological capabilities, digital competencies and organizational readiness. By explicitly aligning the results with prior international evidence, the present study situates its conceptual framework firmly within the global research stream and strengthens its external validity.

4.3. Theoretical Contributions

This study makes several theoretical contributions to the international literature on accounting digitalization. First, it integrates previously fragmented research streams, including automation technologies, digital competencies, ERP dialectics, algorithmic decision-making, behavioral accounting and hybrid intelligence, into a unified socio-technical framework. By doing so, the study responds directly to calls in the international literature for stronger theoretical consolidation and cross-disciplinary integration in research on the digital transformation of accounting. Second, the study advances theoretical understanding by clarifying the mechanisms through which automation reshapes professional roles, how digital competencies mediate professional performance, and how organizational readiness moderates' transformation outcomes. In contrast to prior studies that examine these dimensions in isolation, the proposed framework captures their interdependencies and explains how technological, human and organizational factors jointly reconfigure accounting work. A central theoretical contribution lies in the conceptualization of hybrid accounting expertise, which describes the complementary interaction between algorithmic intelligence and human judgement in contemporary accounting practice. This perspective aligns with and extends emerging international theories of hybrid intelligence by explicitly situating human-AI collaboration within the accounting profession, thereby moving beyond deterministic narratives of technological substitution. Finally, the framework contributes to institutional theory by demonstrating how embedded digital system logics reshape professional norms, accountability structures and interpretive practices. By linking technological infrastructures to institutional change, the study aligns with and extends international research examining the institutional consequences of digital technologies in professional service contexts.

4.4. Practical Implications

The findings of this study offer several practical implications for practitioners, organizations, policymakers and professional bodies involved in the digital transformation of accounting. For accounting professionals, the results highlight the

increasing importance of strengthening digital literacy, data analytics proficiency, algorithmic awareness and ERP fluency. These competencies are no longer complementary but constitute core professional capabilities, a conclusion that is consistent with international professional guidelines and empirical evidence emphasizing the strategic role of digital skills in contemporary accounting practice. At the organizational level, the findings suggest that effective automation outcomes depend on deliberate investments in structured upskilling programmes, agile learning cultures, transparent data governance frameworks and algorithmic oversight mechanisms. International evidence indicates that organizations adopting such practices are better positioned to mitigate technostress, skill displacement and the emergence of informal workarounds, while achieving more sustainable and value-enhancing automation outcomes. Managers are therefore encouraged to align automation initiatives with clear communication strategies, continuous training and participatory implementation processes. Prior international research demonstrates that human-centered implementation approaches reduce resistance to change and enhance employee acceptance of digital technologies. From a regulatory and policy perspective, the results underscore the need for updated frameworks that reflect the growing use of algorithmic decision-making, continuous auditing and AI-based risk assessment in accounting and auditing. Similar regulatory challenges have been identified across international contexts, highlighting the importance of clarifying accountability, transparency and control mechanisms for automated systems. Standard-setting bodies should therefore provide clearer guidance on documentation requirements, explainability standards and professional responsibility in algorithmically supported accounting processes. The findings have important implications for accounting education and professional development. Universities and professional organizations are encouraged to integrate digital competencies, analytics capabilities and hybrid human-AI collaboration skills into accounting curricula and continuing professional development programmes. Such initiatives are essential to ensure that current and future accounting professionals are equipped to operate effectively within digitally intensive and algorithmically mediated environments, in line with evolving international education and professional regulation trends.

4.5. Limitations

This study has several limitations that should be acknowledged when interpreting its findings. First, the research adopts a conceptual, theory-building approach, and the proposed framework has not yet been empirically validated. This limitation is inherent to conceptual research and is consistent with prior studies in the international accounting literature that prioritize theoretical integration and explanation over empirical testing. Second, the literature synthesis is integrative and thematic rather than fully systematic. Although the review draws on peer-reviewed studies from leading international databases and follows explicit selection criteria, it is possible that some relevant empirical contributions were not included. Such limitations are commonly recognized in conceptual and integrative reviews and reflect the trade-off between analytical depth and comprehensive coverage. Third, the generalizability of the findings is constrained by the heterogeneity of regulatory,

technological and institutional contexts across countries, industries and organizational settings. International accounting research frequently highlights that digital transformation processes are context-dependent, which limits the universal applicability of conceptual insights. In addition, the rapid pace of technological development in artificial intelligence, cloud-based ERP systems and advanced analytics means that some recent innovations may have emerged after the period covered by the reviewed literature. This temporal limitation reflects the dynamic nature of digital innovation and underscores the need for continuous theoretical refinement and empirical updating.

4.6. Future Research Directions

Future research should build on the conceptual framework developed in this study by employing empirical, mixed-methods and longitudinal research designs to examine how automation reshapes accounting tasks, competencies and professional identity over time. Longitudinal approaches are particularly valuable for capturing the dynamic and recursive effects of digital transformation, as international research increasingly emphasizes the need to observe professional change processes beyond cross-sectional snapshots. Cross-country comparative studies are also warranted to explore how regulatory environments, cultural norms and institutional arrangements influence automation adoption and professional outcomes in accounting. Such comparative approaches are widely recommended in international accounting research to enhance external validity and to better understand context-specific variations in digital transformation trajectories. Further research should examine psychological mechanisms associated with automation, including autonomy loss, algorithm aversion, overreliance and technostress, which remain underexplored in behavioral accounting studies. In addition, future work could investigate emerging areas such as algorithmic auditing, ethical governance of automated decision systems, digital maturity assessment and the development of validated instruments for measuring digital competencies in accounting. Research focusing on the design of hybrid human-AI collaboration models would further contribute to understanding how professional judgement can be effectively integrated with algorithmic intelligence in accounting practice.

5. Conclusions

Automation and artificial intelligence are redefining the accounting profession by transforming task structures, redistributing expertise and reshaping the nature of professional judgement. The analysis developed in this study demonstrates that automation extends well beyond routine task substitution, influencing cognitive work, altering knowledge flows and redefining how accountants create, validate and interpret financial information. Rather than diminishing professional relevance, intelligent systems reorient the accountant's role toward analytical supervision, exception management, algorithmic auditing and strategic interpretation. By synthesizing fragmented international research, this study offers an integrated conceptual perspective that links automation intensity, digital competencies, organizational readiness and emerging professional roles within a socio-technical

framework. This perspective helps explain why the effects of automation vary substantially across organizations, roles and levels of digital maturity. It also clarifies how accounting professionals must develop hybrid skillsets that combine technical knowledge, data analytics capabilities, agile mindsets, design-thinking skills and ethical judgement, competencies that are increasingly emphasized across contemporary research and professional discourse. The implications for practice are significant. Organizations are encouraged to prioritize structured digital upskilling initiatives, adopt transparent governance frameworks for automated decision systems and foster learning cultures that support responsible experimentation and cross-functional collaboration. Ensuring that algorithmic outputs remain explainable, auditable and aligned with professional standards is essential as cloud-based ERP systems, robotic process automation and advanced analytics become embedded in everyday accounting workflows. At a broader professional level, automation reinforces the need to redefine accounting identity around hybrid human-machine collaboration while safeguarding professional judgement, ethical standards and public trust. As intelligent systems become integral to financial reporting and assurance, the future of the accounting profession will depend on its ability to integrate technological innovation with human expertise in ways that promote accuracy, accountability and sustainable professional development.

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SECTION MANAGEMENT, MARKETING, ECONOMIC INFORMATICS AND CYBERNETICS

ROMANIAN AND KENYAN BUSINESS GRADUATES: EXPLORING THE LINK BETWEEN WORK ENGAGEMENT, REWARDS, AND JOB SATISFACTION

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Abstract: *Developing longer-lasting relationships with graduates, also known as alumni, benefits individuals and universities, enhances organizational performance, and contributes to regional and national renewal. Examining job satisfaction among business graduates from two emerging economies, Romania and Kenya, is an important topic for both countries, as alumni report relatively lower satisfaction compared to their peers from developed economies when receiving equivalent financial and non-financial work rewards. This study therefore aims to highlight the impact of work engagement and rewards on job satisfaction among two groups of business graduates, one from Romania and the other from Kenya. Drawing on social exchange theory complemented by social information processing theory, the authors conducted an exploratory quantitative study involving business graduates from both countries. Data were collected through an online questionnaire and analyzed using SPSS 24.0 software. The results reveal that work engagement is the main predictor of job satisfaction in both groups. Specifically, regression analysis indicates that for Romanian graduates, only one subdimension (vigor) has a significant effect, while for Kenyan graduates, two subdimensions (vigor and dedication) exert a significant and positive influence, whereas the third (absorption) has a negative effect. Unexpectedly, the dimensions of work rewards (financial, recognition and socializing, and promotion and development) exert only a limited and statistically insignificant influence on job search behavior in both groups. Accordingly, this study provides new insights for universities and managers on effectively engaging with alumni and harnessing their potential to enrich business education as well as the local, regional, and national entrepreneurial ecosystem.*

Keywords: *university graduates; Romania; Kenya; work engagement; work rewards; job satisfaction.*

JEL Classification: A23; M20

1. Introduction

Job satisfaction, which arises when people feel happy at work because they manage to fulfill their material and psychological needs through their job, is one of the themes that is garnering increasing interest (Sypniewska, 2014; Judge et al., 2020; Wonah et al., 2025). A significant body of literature has shown that organizations that take employee satisfaction seriously improve the work environment and strengthen their position in their field (e.g., Judge et al., 2020; Daneshmandi et al., 2023). This aspect is also proper for universities, which have long recognized that graduates satisfied with their jobs enhance the reputation of their alma mater, attract students, and strengthen employer relationships, factors that, in turn, influence rankings, accreditation, and funding (e.g., Gustafsson et al., 2018).

In the digital transformation era, job satisfaction among university graduates has gained deeper attraction among researchers, with a recent trend suggesting that alumni surveys be replaced with web search-based analyses (Alemi and Maddox, 2024). However, most studies on graduate job satisfaction overwhelmingly focus on developed markets, while only a few, both in scope and scale, consider emerging markets, such as Mwizerwa et al. (2017) for East Africa and Mitrea (2024) for Romania. Studying job satisfaction among graduates is crucial in emerging markets such as Romania in Europe and Kenya in Africa. Young employees dissatisfied with their workplace often leave their home countries and migrate to more developed nations that offer greater work rewards, potentially at the same level of work engagement. Consequently, our study aims to explore the relationship between work engagement, rewards, and job satisfaction to identify strategies for improving graduates' workplace satisfaction. This aim has positive implications for individuals, universities as institutions that educate specialists, organizations with increasing demands for satisfied experts and professionals, and, ultimately, the economies of both countries, which can thrive only through young, engaged, and fulfilled employees who view work as a significant part of life.

To achieve this goal, we set out to answer the following two research questions:

RQ1: Which specific work rewards—financial compensation, recognition, and social interactions, as well as opportunities for promotion and professional development—are most strongly associated with job satisfaction among business graduates? Furthermore, what are the key similarities and differences between graduates from Romania and Kenya regarding the perceived impact of these rewards on job satisfaction?

RQ2: To what extent does the employee's positive psychological state—characterized by vigor, dedication, and absorption (i.e., work engagement)—correlate with job satisfaction? What are the distinctions and commonalities between Romanian and Kenyan graduates regarding their work engagement components and their relationship to job satisfaction?

The authors conducted an empirical study using a survey methodology to address these research questions, using a questionnaire as the primary research instrument. This questionnaire was administered to graduates of the Faculty of Economic Sciences at the University of Oradea, Romania, and the Business School at Strathmore University, Nairobi, Kenya.

By integrating economic and cultural perspectives from two countries, Romania and Kenya, this study contributes to the consolidation and diversification of existing research on graduates' job satisfaction in diverse cultural contexts, highlighting the importance of dimensions associated with work engagement and reward systems.

2. Theoretical and Contextual Framework

The contemporary economy is strongly influenced by digitalization and globalization, which reshape the labor market and transform both job structures and competency requirements (Wang, Yan and Yang, 2025). The introduction of digital technologies, artificial intelligence, and automation reduces human involvement in repetitive tasks while increasing expectations regarding analytical and creative capabilities (Cristache et al., 2025; Botezat et al., 2025). These transformations require highly educated individuals to adapt continuously to complex, dynamic work environments.

2.1. Cross-National Context

Labor market analyses in Romania show that demographic decline, migration, and technological change intensify pressure on employees and employers alike (Concordia, KPMG and INCE, 2019). Skill requirements evolve rapidly, prompting the need for workforce retraining. Persistent regional disparities and the rise of remote work further complicate labor market dynamics. Romanian specialists, particularly in technical and professional domains, face increased demands for adaptability and efficiency, factors that significantly affect job satisfaction. By 2030, Romania is projected to require more than 600,000 individuals to fill highly skilled positions, including IT professionals, engineers, legal experts, and health specialists. This demand arises in the broader context of Romania having one of the largest groups of mobile workers within the European Union, many of whom are highly educated (EURES, European Employment Services).

In Kenya, demographic trends create a different but equally challenging context. A large share of the population is under 35, and hundreds of thousands of young people enter the labor market annually (KIPPRA, 2024). However, only a small proportion secure stable employment (Danish Trade Union Development Agency, 2024). Despite government initiatives aimed at improving graduate employability, job opportunities remain far below demand. Moreover, employers frequently report that recent graduates are insufficiently prepared for workplace expectations (Njeru, 2025).

These gaps highlight the critical need for skills development programs. Studies emphasize that structured learning opportunities and career development initiatives improve engagement and performance across sectors (Muchibi et al., 2022; Njoroge et al., 2021). Consequently, universities play a central role in better preparing graduates for rapidly shifting labor markets by integrating employability-focused learning experiences.

Understanding how work engagement and rewards influence job satisfaction is essential in both national contexts. Such insights help organizations and universities design strategies to attract, motivate, and retain valuable employees. This is particularly important as societies increasingly expect universities to contribute not

only to education but also to innovation, business creation, and broader economic development.

2.2. Global Importance of Work Rewards, Engagement, and Job Satisfaction

Work rewards, whether financial (salaries, commissions, bonuses) or non-financial (recognition, promotion, development), serve economic, social, and psychological functions in the workplace (Pkite and Ng'eno, 2023) and represent an important expectation among young employees (Botezat, Fotea and Fotea, 2023). According to the Social Exchange Theory, employees assess whether rewards match their effort; when they perceive fairness (Ahmad et al., 2023), motivation and job satisfaction increase (Judge et al., 2020).

Recent literature (e.g., Cooper-Thomas and Morrison, 2018) emphasizes that digital transformation reshapes organizational complexity and employee behavior. Workplace exchanges generate expectations of reciprocity: employees anticipate fair rewards, while organizations expect positive attitudes, described through work engagement (WE) (Schaufeli, 2012). Engagement is reflected in vigor, dedication, and absorption and is supported by personal resources such as optimism (Xanthopoulou et al., 2007) and personality traits like openness and conscientiousness (Schaufeli, 2016). Situational factors also matter, including a supportive work climate (Schaufeli, 2016) and transformational leadership (Shkoler and Tziner, 2020). Graduates' work engagement contributes to performance (Rotich, 2020; Njoroge et al., 2021) and positively affects job satisfaction (Nemțeanu and Dabija, 2020).

Job satisfaction trends in Romania have evolved alongside increased workplace flexibility and changing economic conditions (Davidescu et al., 2020; Botezat, Fotea and Fotea, 2023). PwC's 2023 survey shows that many employees plan to change jobs due to concerns about development and work conditions. In Kenya, a Brighter Monday report (2021) indicated that while most employees view job satisfaction as essential for productivity, fewer than half are satisfied with their roles. Job satisfaction is shaped by fair compensation, promotion opportunities, skill development, autonomy, meaningful work, and supportive relationships (Nemțeanu and Dabija, 2020).

Based on social processing theory (Salancik and Pfeffer, 1978), employees interpret their environment through interactions and expectations. Dissatisfaction arises when anticipated career growth or meaningful work does not align with experience. Negative interactions or limited advancement opportunities can reduce performance and affect universities, as dissatisfied alumni may harm institutional reputation and weaken collaboration with employers. Understanding the relationship between rewards, engagement, and satisfaction among alumni in Romania and Kenya can guide strategies for strengthening graduate outcomes, employer partnerships, and university reputation.

3. Research Methodology

3.1. Samples

To answer our research questions, we conducted an exploratory study between March and May 2025 involving 125 graduates, divided into two groups. Group 1

comprises 62 graduates from the Faculty of Economic Sciences at the University of Oradea. Group 2 comprises 63 graduates from the Business School at Strathmore University in Nairobi, Kenya. In both groups, most respondents belong to Generation Z, comprising those born between 1995 and 2010. In Group 1, they represent 64% of the total, while in Group 2, they account for 66%. Regarding gender distribution, Romanian respondents are predominantly female (67%), whereas the Kenyan respondents have a more balanced distribution, with a slight male majority (51%) compared to females (49%). Regarding work experience, in both groups, those with more than five years of experience hold the largest share, forming the majority in Romania (52%), 9% higher than their Kenyan counterparts (43%). Regarding job numbers, Romanian graduates tend to have more jobs than their Kenyan counterparts, with 33% having had between 4 and 6 jobs, three times higher than the 11% reported among Kenyan graduates. As expected, the average number of family members is higher among Kenyan graduates, with 34% reporting more than four family members, compared to just 4% among Romanian respondents. Regarding job market standing, a key difference is the higher percentage of freelancers and entrepreneurs among Romanian respondents, which is twice as high as that of Kenyan respondents.

3.2. Variables and their Operationalization

The research employed survey technique, using an online questionnaire as the primary tool. The questionnaire consisted of two sections. The first section focused on socio-demographic data, while the second included questions related to the three dimensions investigated: work rewards, work engagement, and job satisfaction. Graduates from two faculties in Romania and Kenya were invited to evaluate these dimensions using a five-point Likert scale.

The operationalization of the dimensions investigated was carried out as follows:

- Work rewards: 12 items measuring the importance respondents attribute to financial rewards, recognition and socializing, and promotion and development opportunities (Falola et al., 2014; Botezat, Fotea, and Fotea, 2023).
- Work engagement: 17 items measuring the extent to which respondents agree with statements describing the positive state at the workplace, characterized by energy, absorption, and dedication (Schaufeli, Bakker and Salanova, 2006).
- Job satisfaction: 10 items measuring the extent to which the current or most recent job provided satisfaction across key job facets, such as work-life balance, pay and benefits, environment, recognition, and autonomy (Davidescu et al., 2020; Rotich, 2020; Nemțeanu and Dabija, 2020; Obonyo and Felistus, 2021).

4. Results

4.1. Descriptive statistics

Table 1 presents the results of the descriptive statistical analysis (minimum, maximum, mean, and standard deviation) for the scores obtained by the two groups of participants regarding work rewards, work engagement, and job satisfaction.

Table 1: Descriptive statistics for the measures of Job Satisfaction (JS), Work engagement (WE), and Work rewards (WR)

Variable/ dimensions	Group 1: UO-FSE (N=62)				Group 2: SU-SBS (N=63)			
	Min.	Max.	Mean	Standard deviation	Min.	Max.	Mean	Standard deviation
Job Satisfaction (JS)	1.00	5.00	3.8651	.91671	1.50	4.71	3.3819	.79063
Work engagement (WE)	1.47	5.00	3.6779	.73142	2.00	4.94	3.4267	.67152
WE - Vigor (WE – VI)	1.33	5.00	3.6481	.76617	1.67	5.00	3.3677	.70020
WE - Absorption (WE – AB)	1.50	5.00	3.5635	.72366	1.67	4.83	3.3228	.75839
WE - Dedication (WE – De)	1.00	5.00	3.8508	.94286	1.80	5.00	3.6222	.78462
Work rewards (WR)	1.25	4.92	3.8228	.73560	2.25	5.00	3.9802	.52868
WR – Financial (WR – Fi)	1.20	5.00	3.9937	.86358	2.20	5.00	4.2730	.57843
WR - Recognition and socializing (WR – RS)	1.00	4.80	3.4254	.83973	1.40	5.00	3.4349	.77754
WR - Promotion and development (WR – PD)	1.00	5.00	4.3889	.83010	2.00	5.00	4.6111	.66262

Source: own research

Overall, our findings indicate that job satisfaction and rewards, as well as work engagement, among both Romanian and Kenyan graduates, are at a moderate to high level, with a more pronounced tendency toward differentiation among Romanian respondents. As expected, the highest mean score in both groups (3.82 for Romanian graduates and 3.98 for Kenyan graduates) was recorded for the variable Work Rewards (WR). At the dimension level, the most highly valued was WR – Promotion & Development, with mean scores of 4.39 and 4.61, respectively, while the least valued was WR – Recognition & Socializing, with approximately equal means across the two groups (≈ 3.43). The standard deviation values (0.73 and 0.53) show that respondents' perceptions of work rewards exhibit moderate variability, which is lower in the Kenyan group. Regarding Work Engagement (WE), the lowest mean in both groups was obtained for WE – Absorption (3.56 and 3.53, respectively). Furthermore, it is noteworthy that WE—Absorption is the only component for which the standard deviation is higher among Kenyan respondents than among Romanian respondents, suggesting greater variability: some graduates being highly absorbed in their work activities, while others less so.

4.2. Inferential statistics results

To assess the normality of the data distribution, the Kolmogorov-Smirnov test was applied. In our case, the normality of the distribution of composite variables was evaluated separately for the two groups (Group 1: UO-FSE and Group 2: SU-SBS). As the data analysis revealed, some variables showed significant deviations from normality ($p < .05$). In such situations, nonparametric tests were considered alongside parametric analyses. Consequently, to identify the bivariate relationships among the main variables examined in this study (i.e., JS, WE, and WR), Spearman's correlation coefficient was employed.

Spearman's correlation analysis revealed a significant association between JS and WE for both UO-FSE graduates ($p = .571$, $p < .01$) and SU-SBS graduates ($p = .586$, $p < .01$). On the other hand, no statistically significant relationships were identified in either group between JS and WR or between WE and WR. Due to the non-normal distribution of data, Mann-Whitney U tests were used to examine whether significant differences existed between the two groups. The results indicated significant differences for job satisfaction ($p = 0.001$), overall work engagement ($p = 0.030$), WE – Vigor ($p = 0.022$), and WE – Dedication ($p = 0.047$). The WE-Absorption dimension (part of the Work Engagement scale) and the Work Rewards scale (with its subscales Financial, Recognition, and Promotion) did not show statistically significant differences.

Since the aim was to determine whether the study participants perceived the dimensions/components of the variables WE and WR differently, a Repeated Measures ANOVA was employed. The results obtained are summarized in Tables 2 and 3.

Table 2: Repeated-Measures ANOVA Results for Work Engagement Dimensions

Group	Work Engagement Dimension	Mean / Std. Deviation	Repeated-Measures ANOVA Results	Pairwise Comparisons (Bonferroni)
Group 1: UO-FSE (N = 62)	Vigor (VI)	3.65 (0.77)	Main Effect of Dimension: F(2, 124) = 7.68, * p * = .001, $\eta^2p = .110$ Mauchly's Test: W = .911, * p * = .058 (Sphericity assumed)	Dedication > Vigor (MD = 0.20, SE = 0.07, * p * = .009) Dedication > Absorption (MD = 0.29, SE = 0.09, * p * = .004) Vigor vs. Absorption (MD = 0.09, SE = 0.07, * p * = .774)
	Absorption (AB)	3.56 (0.72)		
	Dedication (DE)	3.85 (0.94)		
Group 2: SU-SBS (N = 63)	Vigor (VI)	3.37 (0.70)	Main Effect of Dimension: F(2, 124) = 10.15, * p * <	Dedication > Vigor (MD = 0.25, SE = 0.08, * p * = .005) Dedication >
	Absorption (AB)	3.32 (0.76)		

Group	Work Engagement Dimension	Mean / Std. Deviation	Repeated-Measures ANOVA Results	Pairwise Comparisons (Bonferroni)
	Dedication (DE)	3.62 (0.78)	.001, $\eta^2p = .141$ Mauchly's Test: $W = .953$, $*p^* = .228$ (Sphericity assumed)	Absorption (MD = 0.30, SE = 0.07, $*p^* < .001$) Vigor vs. Absorption (MD = 0.04, SE = 0.06, $*p^* = 1.000$)

Note: MD = Mean Difference; SE = Standard Error; η^2p = Partial Eta Squared.
Source: own research

Table 3: Repeated-Measures ANOVA Results for Work Rewards Dimensions

Group	Work Rewards Dimension	Mean / Std. Deviation	Repeated-Measures ANOVA Results	Pairwise Comparisons (Bonferroni)
Group 1: UO-FSE (N = 62)	Financial (Fi)	3.99 (0.86)	Main Effect of WR_dim: $F(2, 124) = 48.31$, $*p^* < .001$, $\eta^2p = .438$ Mauchly's Test: $W = .959$, $*p^* = .279$ (Sphericity assumed)	Promotion & Development > Financial (MD = 0.40, $*p^* = .001$) Promotion & Development > Recognition & Socializing (MD = 0.96, $*p^* < .001$) Financial > Recognition & Socializing (MD = 0.57, $*p^* < .001$)
	Recognition & Socializing (RS)	3.43 (0.84)		
	Promotion & Development (PD)	4.39 (0.83)		
Group 2: SU-SBS (N = 63)	Financial (Fi)	4.27 (0.58)	Main Effect of WR_dim: $F(1.81, 112.41) = 81.34$, $*p^* < .001$, $\eta^2p = .567$ Mauchly's Test: $W = .897$, $*p^* = .036$ (Greenhouse-Geisser correction)	Promotion & Development > Financial (MD = 0.34, $*p^* < .001$) Promotion & Development > RS (MD = 1.18, $*p^* < .001$) Financial > Recognition & Socializing (MD = 0.84, $*p^* < .001$)
	Recognition & Socializing (RS)	3.43 (0.78)		
	Promotion & Development (PD)	4.61 (0.66)		

Note: MD = Mean Difference; SE = Standard Error; η^2p = Partial Eta Squared.
Source: own research

As shown by the data presented in Table 2, the results indicate significant differences in WE across its dimensions for both groups ($F(2, 124) = 7.68, p = .001, \eta^2p = .110$ for Group 1: UO-FSE, and $F(2, 124) = 10.15, p < .001, \eta^2p = .141$ for Group 2: SU-SBS). Pairwise comparisons using the Bonferroni correction revealed that Dedication scores were significantly higher than both Vigor and Absorption ($p < .01$), while no significant difference was observed between Vigor and Absorption ($p > .05$).

Regarding WR, as shown in the results presented in Table 2, significant differences were identified among the three reward dimensions for both institutions — $F(2, 124) = 48.31, p < .001, \eta^2p = .438$ for Group 1: UO-FSE, and $F(1.81, 112.41) = 81.34, p < .001, \eta^2p = .567$ for Group 2: SU-SBS. Pairwise comparisons indicated that Promotion and Development was rated significantly higher than both Financial and Recognition & Socializing rewards ($p < .001$), while Financial rewards also scored significantly higher than Recognition & Socializing ($p < .001$). These findings suggest that individuals from both groups place the greatest emphasis on professional advancement opportunities, followed by financial incentives and, to a lesser extent, social or recognition-related rewards, with significant differences observed among all three types of WR.

Next, Pearson correlations were examined between the dependent variable (Job Satisfaction, JS) and the independent variables (Work Engagement, WE, and Work Rewards, WR). The predictors considered were the subdimensions of the two constructs: Work Engagement and Work Rewards. The analysis aimed to verify the existence of linear relationships among the variables, a necessary condition for applying multiple linear regression. Tables 4 and 5 present the Pearson correlations separately for the two groups.

Table 4: Pearson correlations between study variables for Group 1: UO-FSE

Variable	1	2	3	4	5	6	7
1. Job satisfaction (JS)	—						
2. WE – Vigor (WE – VI)	.543** (.000)	—					
3. WE – Absorption (WE – AB)	.373** (.003)	.689** (.000)	—				
4. WE – Dedication (WE – DE)	.493** (.000)	.834** (.000)	.702** (.000)	—			
5. WR – Financial (WR – Fi)	-.007 (.955)	-.175 (.170)	-.001 (.993)	-.143 (.263)	—		
6. WR – Recognition & Socializing (WR – RS)	.230 (.072)	.172 (.178)	.342** (.006)	.206 (.105)	.664** (.000)	—	
7. WR – Promotion & Development (WR – PD)	.100 (.441)	-.084 (.515)	-.098 (.446)	-.079 (.537)	.530** (.000)	.518** (.000)	—

Note: Pearson correlation coefficients (r) are displayed in the first row, with significant correlations in bold. Two-tailed p-values are shown in parentheses.

** $p < .01$

Source: own research

Table 5: Pearson correlations between study variables for Group 2: SU-SBS

Variable	1	2	3	4	5	6	7
1. Job Satisfaction (JS)	—						
2. WE – Vigor (WE – VI)	.603** (.000)	—					
3. WE – Absorption (WE – AB)	.364** (.003)	.762** (.000)	—				
4. WE – Dedication (WE – DE)	.550** (.000)	.665** (.000)	.715** (.000)	—			
5. WR – Financial (WR – Fi)	-.023 (.855)	.022 (.867)	.171 (.180)	.221 (.082)	—		
6. WR – Recognition & Socializing (WR – RS)	.070 (.588)	.101 (.429)	.081 (.529)	.047 (.712)	.333** (.008)	—	
7. WR – Promotion & Development (WR – PD)	-.024 (.851)	.032 (.802)	.085 (.506)	.101 (.433)	.505** (.000)	.355** (.004)	—

Note: Pearson correlation coefficients (r) are displayed in the first row, with significant correlations in bold. Two-tailed p-values are shown in parentheses.

** p < .01

Source: own research

Based on the results presented in Tables 4 and 5, it can be observed that both groups show positive (moderate to strong) correlations between JS and the three components of the WE construct (with values ranging from $r = .373$, $p = .003$ to $r = .543$, $p = .000$ for Group 1: UO-FSE, and from $r = .364$, $p = .003$ to $r = .603$, $p = .000$ for Group 2: SU-SBS). This conclusion represents an essential condition for proceeding with the multiple linear regression analysis. In contrast, no statistically significant associations were found between JS and any of the components related to the WR construct, although a marginal trend ($p = .072$) was observed for the Recognition & Socializing dimension in Group 1: UO-FSE.

Since the simple linear regression analysis indicated a potential risk of multicollinearity due to strong correlations among certain predictors—particularly between the subdimensions of WE—the potential issue of multicollinearity was examined prior to conducting the multiple linear regression analysis by checking the Variance Inflation Factor (VIF) and Tolerance indicators. The VIF values for all subdimensions of Work Engagement and Work Rewards were below 5 (ranging from 1.627 to 3.349 for Group 1: UO-FSE and from 1.219 to 2.985 for Group 2: SU-SBS), while the Tolerance values were greater than 0.20 for all predictors. Therefore, since no multicollinearity problems were detected, all predictors were simultaneously included in the regression models. After verifying multicollinearity, the multiple linear regression analysis was conducted to determine the extent to

which the subdimensions of WE (Vigor, Absorption, Dedication) and WR (Financial, Recognition & Socializing, Promotion & Development) explain the variance in the dependent variable JS. The main results are summarized in Tables 6 and 7.

Table 6: Multiple Linear Regression Results for the Group 1: UO-FSE

Predictors	B	SE B	β	t	Sig.	Zero-order	Partial	Part
(Constant)	.878	.888	—	.988	.327	—	—	—
WE – Vigor	.577	.260	.448	2.216	.031*	.543	.286	.245
WE – Absorption	-.135	.227	-.107	-.594	.555	.373	-.080	-.066
WE – Dedication	.177	.206	.173	.862	.393	.493	.115	.095
WR – Financial	-.060	.175	-.057	-.344	.733	-.007	-.046	-.038
WR – Recognition and socializing	.145	.194	.134	.751	.456	.230	.101	.083
WR – Promotion and development	.091	.155	.082	.584	.562	.100	.078	.064

*p<0,05

Source: own research

Dependent variable: Job Satisfaction

R = .573; R² = .329; Adjusted R² = .255; F(6, 55) = 4.486, p = .001; Std. Error = .79107; Durbin–Watson = 1.865

Table 7: Multiple Linear Regression Results for the Group 2: SU-SBS

Predictors	B	SE B	β	t	Sig.	Zero-order	Partial	Part
Constant	1.231	0.730	—	1.686	0.097	—	—	—
WE – Vigor	0.701	0.181	0.621	3.871	0.000**	0.603	0.459	0.374
WE – Absorption	-0.445	0.174	-0.426	-2.554	0.013*	0.364	-0.323	-0.247
WE – Dedication	0.461	0.148	0.457	3.108	0.003*	0.550	0.384	0.300
WR – Financial	-0.085	0.164	-0.062	-0.519	0.606	-0.023	-0.069	-0.050
WR – Recognition and Socializing	0.056	0.108	0.055	0.515	0.608	0.070	0.069	0.050
WR – Promotion and Development	-0.050	0.137	-0.042	-0.365	0.716	-0.024	-0.049	-0.035

*p<0,05; **p<0,01

Source: own research

Dependent variable: Job Satisfaction

R = .691; R² = .477; Adjusted R² = .421; F(6, 56) = 8.518, p < .001; Std. Error = .60153; Durbin–Watson = 1.773

As shown in the tables above, the regression models for both groups are statistically significant (for Group 1: UO-FSE, F(6, 55) = 4.486, p = .001, R² = .329; Adjusted R² = .255, explaining about 25.5% of the variance in Job Satisfaction; for Group 2: SU-SBS, F(6, 56) = 8.518, p < .001, R² = .477; Adjusted R² = .421, explaining about 42.1% of the variance in Job Satisfaction). For both models, the Durbin–Watson

coefficient falls within the acceptable range (1.5–2.5), with values of 1.865 for Group 1: UO-FSE and 1.773 for Group 2: SU-SBS, confirming the independence of residuals.

For Group 1: UO-FSE, Vigor ($\beta = .448$, $p = .031$) emerged as a positive and significant predictor of Job Satisfaction, while the other predictors (WE – Absorption, WE – Dedication, WR – Financial, WR – Recognition & Socializing, WR – Promotion & Development) did not show significant associations. For Group 2: SU-SBS, Vigor ($\beta = .621$, $p < .001$) and Dedication ($\beta = .457$, $p = .003$) were identified as positive and significant predictors, whereas Absorption ($\beta = -.426$, $p = .013$) had a negative and significant effect on Job Satisfaction.

Analysis of the semi-partial correlation coefficients indicates that for Group 1: UO-FSE, Vigor is the strongest predictor of Job Satisfaction, accounting for approximately 6% of the total variance on its own ($r_{\text{part}} = .245$; $r_{\text{part}}^2 = .06$). For Group 2: SU-SBS, the semi-partial coefficients show that Vigor ($r_{\text{part}} = .374$; $r_{\text{part}}^2 = .139$) explains about 14.0% of the variance, Dedication ($r_{\text{part}} = .300$; $r_{\text{part}}^2 = .09$) explains 9.0%, and Absorption ($r_{\text{part}} = -.247$; $r_{\text{part}}^2 = .061$) accounts for 6.1% when each is considered individually.

5. Conclusions

This study examined how components of work rewards (WR) (financial compensation; recognition and social interactions; opportunities for promotion and development) and work engagement (WE) (vigor, dedication, absorption) impact job satisfaction (JS), using two graduate groups: one from the Faculty of Economic Sciences at the University of Oradea, Romania (Group 1: UO-FSE) and one from the Business School at Strathmore University in Nairobi, Kenya (Group 2: SU-SBS). The regression results indicate that WE is the main predictor of JS in both groups. For Group 1, only vigor shows a significant effect. For Group 2, both vigor and dedication have a positive influence, while absorption has a negative effect. These findings align with studies showing the positive role of vigor and dedication in predicting JS (Sypniewska et al., 2023). The negative absorption effect among Kenyan graduates may relate to research suggesting that high absorption can evolve into workaholism, associated with adverse long-term outcomes (Di Stefano and Gaudiino, 2018; Sypniewska et al., 2023). This interpretation remains a hypothesis requiring further investigation. Differences between the two groups—specifically that both vigor and dedication are significant among Kenyan graduates—may be partly explained by Mazzetti et al. (2023). Their meta-analysis emphasized that collectivist cultural environments, such as Kenya, demonstrate a stronger association between feedback and engagement compared to individualistic environments, such as Romania tend to become after EU accession. However, other studies conducted within African collectivist contexts have reported a weak yet statistically significant negative correlation between work engagement and job satisfaction (Wonah et al., 2025). This relationship has been interpreted as suggesting that WE may, under certain conditions, diminish JS, potentially due to factors such as work intensification, which parallels the absorption dimension and, at its extreme, resembles workaholism.

Additionally, WR dimensions show only limited and statistically insignificant influence on JS in both groups, contrasting with meta-analytic trends (Cao, Arshad and Liu, 2025, p. 48). This is unexpected, especially given the cultural differences between samples. One explanation could be that in contexts such as Romania and Kenya, rewards matter less than intrinsic elements like workplace atmosphere or job stability (Sypniewska, 2014, p. 67), reducing the predictive power of WR. WR may attract employees initially or boost short-term motivation but do not necessarily generate lasting satisfaction. More research is needed to substantiate these assumptions.

This study has limitations: a relatively small sample and exclusive reliance on self-reported data. Additionally, socio-demographic variables such as tenure, salary, and organizational position were not included in our present analysis. Future studies should use more representative samples, including broader variables, and employ more advanced designs and analytical tools. Despite limitations, the study enhances understanding of JS among graduates by revealing substantial cross-cultural similarities and only modest differences. The findings support the idea that intrinsic factors are key drivers of JS, with the vigor dimension of WE emerging as a particularly salient predictor.

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THE CRITICAL ROLE OF COMMUNICATION AND COLLABORATION IN THE MODERN WORKPLACE: INSIGHTS FROM EMPLOYEE FEEDBACK AND PRIVATE SECTOR PRACTICES

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Abstract: *Effective communication and collaboration are fundamental to organizational success, yet their application and institutionalization vary widely between sectors. This paper synthesizes findings from private sector employee feedback with insights from EU-level analyses of public administration, highlighting the systemic importance of internal dynamics. While private organizations increasingly use structured tools to assess communication and collaboration, public administrations often lack mechanisms for gathering feedback from civil servants. EU case studies and comparative reports reveal that hierarchical rigidity, fragmented organizational frameworks, and limited cross-functional interaction hinder performance in many public institutions. The quality of internal communication and collaboration is more than an HR concern; it is a strategic factor that influences a region's economic trajectory. High-performing public administrations are better equipped to design and deliver effective policies, attract investment, and foster a trustworthy environment for private sector development. Conversely, weak internal dynamics contribute to inefficiencies that undermine public trust and economic competitiveness. This paper argues for a shift in public sector culture: investing in leadership, inclusive feedback systems, and interdepartmental coordination. By institutionalizing communication and collaboration as core competencies, public administrations can not only improve internal operations, but also act as catalysts for broader economic growth and regional resilience across the European Union.*

Keywords: *communication; collaboration; private sector; public sector; EU funds; peripheral regions; employee engagement*

JEL Classification: H83; O18; R58; M12

1. Introduction

Communication and collaboration are increasingly acknowledged as foundational dimensions of organizational effectiveness. In the private sector, they are systematically cultivated through structured employee feedback mechanisms, collaborative tools, and inclusive leadership practices. These internal dynamics are no longer perceived as ancillary, but as strategic capabilities that support innovation, agility, and institutional resilience.

Conversely, public administrations frequently operate within rigid and hierarchical structures where employee voice is limited, and communication silos persist. This organizational fragmentation weakens institutional learning, obstructs adaptive governance, and undermines service delivery. The consequences extend beyond internal performance: public institutions that neglect communication and

collaboration face declining legitimacy, ineffective policy implementation, and reduced investment attractiveness.

This paper explores how internal communication and collaboration affect institutional performance and contribute to regional socio-economic outcomes. Through a dual lens grounded in structured private sector feedback and public sector institutional analysis it identifies transferable practices and proposes context-sensitive reforms that strengthen public sector capacity.

2. Literature Review

Extant literature consistently underscores the positive correlation between internal communication, collaboration, and organizational performance (Edmondson, 1999; Robbins and Judge, 2020). In the private sector, empirical studies affirm that these practices are closely tied to employee satisfaction, organizational trust, and innovation capacity. Structured feedback mechanisms and participatory leadership are increasingly deployed to harness employee insights and foster institutional responsiveness. One illustrative example is the structured feedback collected from employees of a private company operating within an EU Member State, where qualitative data revealed significant emotional responses both positive and negative tied to communication and collaboration practices. Employees cited frustration, fear, and disengagement as consequences of unclear messages, inconsistent collaboration, and a lack of psychological safety, while positive mentions emphasized trust, appreciation, and professional fulfilment when effective practices were in place.

Public administrations, in contrast, lag in integrating these practices. Despite strategic frameworks such as the European Commission's Quality of Public Administration Toolbox (2022), feedback systems remain underdeveloped and inconsistently applied across Member States. Reports by the European Court of Auditors (2021) and the OECD (2021) highlight persistent barriers including hierarchical rigidity, poor interdepartmental coordination, and minimal employee engagement in institutional reform processes.

This paper contributes to the literature by juxtaposing private sector practices with public sector conditions, thereby providing a critical lens for examining how communication and collaboration can be institutionalized to improve public sector outcomes. While literature affirms the strategic importance of communication and collaboration, empirical evidence shows that the public sector continues to trail the private sector in adopting inclusive, data-informed practices, despite the significant role public institutions play in shaping the EU's development trajectory and impact on private investments

3. Methodology

This paper uses a comparative qualitative methodology to explore the role of internal communication and collaboration in shaping organizational performance, using a dual-source approach: (1) primary qualitative data gathered from a private company operating within an EU Member State, and (2) secondary analysis of EU-level literature, policy documents, and case studies concerning public sector institutions. In the private sector, structured feedback mechanisms have been shown to improve trust and performance (Edmondson, 1999; Robbins and Judge, 2020). In contrast,

public administrations struggle to institutionalize such mechanisms (OECD, 2021; EIPA, n.d.).

Case studies confirm that fragmented organizational frameworks hinder cross-departmental collaboration (Bouckaert, Kuhlmann and Reiter, 2020), while hierarchical rigidity often blocks institutional learning (Capano, Howlett and Ramesh, 2015).

3.1 Private sector feedback analysis

The private sector component is based on employee feedback collected through structured workshops conducted internally by the company. Participants were selected using eNPS (Employee Net Promoter Score) segmentation to ensure representation across departments. During the workshops, employees engaged in guided sessions resembling the Six Thinking Hats methodology, providing insights across cognitive and emotional dimensions. Themes included communication practices, collaboration dynamics, trust, psychological safety, and leadership accessibility. Data was thematically analysed, identifying emotional patterns (positive, negative, neutral) and recurring issues that impact workplace performance.

3.2 Public sector component

The public sector analysis is based on institutional documents and best practice case studies from the European Commission, European Court of Auditors, OECD, and EIPA. These sources provided critical insights into the status of internal coordination, leadership practices, and communication mechanisms in regional and national administrations.

The documents were examined for recurring themes related to communication and collaboration, the presence or absence of feedback mechanisms, and their implications for institutional effectiveness.

This paper draws on structured employee feedback collected from a private company in one EU Member State, applying qualitative analysis in line with organizational behaviour research (Edmondson, 1999).

For public sector insights, secondary sources include tools and reports developed by the European Commission (2022), the OECD (2020–2023), and the European Court of Auditors (2021).

3.3 Comparative analytical approach

The paper identifies sector-specific patterns and crosscutting issues by comparing the private sector's employee-centred evidence with public sector institutional dynamics. Its originality lies in developing a cross-sectoral diagnostic framework that captures early indicators of institutional misalignment, such as communication breakdown, emotional disengagement, and isolated practices, which are often overlooked in conventional public administration literature. It proposes an analytical framework for assessing communication and collaboration quality, with potential for institutional transfer. This framework can be adapted by public administrations to diagnose internal dysfunctions, prioritize feedback-informed reform measures, and benchmark progress in cultivating collaborative cultures. This constitutes the paper's theoretical and empirical contribution, offering a structured methodology for institutional learning grounded in comparative insights.

4. Findings

The structured workshops conducted in the private sector elicited a broad spectrum of emotional and cognitive responses to internal communication and collaboration. Thematic analysis of participant input revealed several patterns.

4.1 Data presentation private sector

The private sector analysis provides valuable insights into the current state of communication and collaboration, highlighting both significant challenges and areas for potential growth based on employee feedback. The review process involved selecting candidates from each department based on eNPS results and grouping them into teams for workshops. During these workshops, participants used a structured thinking method, potentially similar to the *Six Thinking Hats* framework that explores different perspectives including facts, emotions, risks, benefits, creativity and process. Team members were also instructed to collect information from colleagues, ensuring a broader representation of views.

Content analysis of the discussions revealed a marked prevalence of negative sentiment regarding communication and collaboration. In the domain of communication, the emotion most frequently expressed was frustration (33 mentions), often linked to inefficiencies, lack of message clarity, and delayed responsiveness. Fear (13 mentions) was also prominent, primarily reflecting apprehension around idea-sharing, potential criticism, or work overload. Additional sentiments such as uncertainty, disappointment, and stress further illuminated a complex emotional landscape. Feedback on collaboration mirrored these themes: frustration (16 mentions) and fear (5) dominated, with employees citing experiences of being ignored, isolated, or blocked in team contexts. These emotions were compounded by a perceived absence of support and psychological safety.

Despite this emotional burden, the feedback also included 382 neutral mentions for communication and 311 for collaboration. These reflected a general awareness of the significance of communication and teamwork, as well as a willingness to improve. Words like *understanding*, *responsibility*, and *curiosity* indicated latent capacity for reform. Positive emotions, though fewer, were also present - 47 in communication and 63 in collaboration emphasizing experiences of *trust*, *encouragement*, *optimism*, and *professional satisfaction* when communication structures functioned effectively. Thematic synthesis identified multiple structural and behavioural challenges:

- (i) employee feedback frequently cited hierarchical opacity, with senior leadership perceived as distant or unresponsive;
- (ii) communication was seen to vary significantly by team and individual, suggesting a lack of standardized practices;
- (iii) a pervasive sense of inequity emerged from reports of accountability imbalances and workload misallocation; and
- (iv) organizational segmentation was found to restrict knowledge sharing and effective cross-functional collaboration.

In response, employees proposed a series of actionable recommendations, including:

- implementing training on feedback, conflict resolution, active listening and effective communication and collaboration;

- strengthening relationships and encouraging teamwork across departments and team building workshops;
- improving employee recognition and incentives: implementing a peer-to-peer recognition program;
- improving cross-team communication and collaboration: hosting regular department and meetings and defining collaboration ground rules;
- enhancing meeting efficiency: implementing meeting guidelines requiring agendas and action items and potentially "*no meeting Fridays*";
- hosting monthly "*ask me anything*" sessions with leadership and training leaders on collaborative and transparent management and encourage open dialogue and trust;
- launching a "*psychological safety*" initiative and a "*safe to fail*" initiative to encourage open sharing and innovation and to normalize constructive dissent and support inclusive dialogue;
- enhanced use of collaborative digital platforms for visibility and transparency;

Several of these proposals are now undergoing implementation, including training in feedback delivery and team dynamics, peer-to-peer recognition platforms, and standardization of collaborative expectations across departments. This case underscores how a data-driven approach to employee feedback can inform internal governance models and enable systematic reform. It also illustrates the critical role of leadership in anchoring such reforms in organizational culture, echoing broader public sector findings.

4.2 Case study - public sector

The public service centre, also called "*the Pyramid*", inaugurated by Oradea City Hall in 2023 integrates 27 dispersed service counters into a single, glass-enclosed facility that blends architectural transparency with procedural simplification. Prior to the reform, residents navigated an average of three separate offices and waited 55 minutes for basic administrative tasks. Six months after implementation, the mean waiting time fell to 17 minutes, and citizen satisfaction scores (captured through on-site counters) rose from 62% to 88%. Crucially, these gains were reinforced by a bespoke training curriculum for 130 civil servants, covering active listening, plain-language communication, and conflict de-escalation. Interviews with frontline staff revealed that the new layout encouraged spontaneous peer consultation and reduced hierarchical bottlenecks, mirroring the collaborative clusters observed in high-performing private organisations. This case exemplifies how investment in internal communication and service orientation can transform administrative effectiveness and public trust.

When juxtaposed with the private sector case analysed where frustration and fear dominated employee sentiment due to isolated workflows and email overload, on the other hand the public case, the *Pyramid* highlights three differentiators:

- service orientation - whereas the private company struggled with an inward administrative focus, the *Pyramid*'s design embeds an external, citizen-centric metric (waiting time) that stimulates cross-desk coordination;

- physical and digital co-location – by co-locating counters and deploying a unified queue-management system, the *Pyramid* replicates the digital dashboards adopted by the private company;
- both contexts invested in training; however, the *Pyramid* tied modules to clear behavioural standards (e.g., a “no wrong desk” rule), yielding measurable trust gains among both employees and service users.

4.3 Interpretation

These findings suggest that communication and collaboration are not solely technical processes but also shape organizational identity and psychological safety. Effective practices help cultivate an environment of mutual accountability, while deficiencies create emotional distance and operational fragmentation.

The recurring themes were synthesized into a diagnostic framework to identify early indicators of institutional misalignment: emotional disengagement, communication fatigue, and isolated behaviors. While derived from the private sector, these indicators are applicable to public institutions, where similar challenges are compounded by bureaucratic inertia and limited feedback loops.

5. Discussion

The findings affirm that employee-centred strategies common in high-performing private companies offer actionable insights for public sector reform. Transparent communication, inclusive leadership, and cross-functional collaboration are not merely efficiency tools but foundational to trust and institutional legitimacy.

The positive correlation between transparent communication and timely project delivery supports previous research on administrative coherence (Fernandez and Rainey, 2006). When information flows are clear and uninterrupted, teams are better positioned to respond to evolving EU regulatory demands. In a policy environment characterized by complexity and multilevel governance, adaptive communication practices are vital for institutional resilience.

Similarly, collaborative mechanisms such as cross-functional task forces are found to mitigate bureaucratic fragmentation and foster collective accountability. These results resonate with Bouckaert et al.'s (2020) findings on horizontal coordination and highlight the need for structured interdepartmental linkages in regional administrations.

A key contribution of this paper is its emphasis on employee voice and engagement. Feedback mechanisms not only improve ethics but also serve as indicative tools for identifying inefficiencies. Involving staff in post-project reviews and organizational learning builds institutional memory and strengthens the foundation for continuous improvement. This reinforces the European Commission's emphasis on human-centric governance models under programs like the Just Transition Mechanism (European Commission, 2023).

Another implication is the critical role of leadership. Managers who practice open-door policies and encourage bottom-up dialogue set the tone for inclusive governance. Leadership training and strategic communication competencies should thus be prioritized in capacity-building programs funded through technical assistance instruments.

Digitalization emerged as both a facilitator and a performance differentiator. Regions that adopted collaborative digital platforms demonstrated not only better fund absorption rates but also enhanced interagency transparency. These practices align with the EU's Digital Decade objectives and should be mainstreamed across all managing authorities (European Commission, 2022).

Comparative evidence from the *Pyramid* in Oradea further underscores the potential for public sector innovation. By integrating 27 service counters and training civil servants in active listening and clear communication, the initiative not only reduced wait times by 70% but also significantly improved employee collaboration and citizen satisfaction. This case demonstrates that spatial design, citizen-centred metrics, and behavioural training can yield measurable improvements in workplace cohesion and trust (Oradea City Hall, 2023).

While in the private sector, such analyses bring significant value and helps shaping a way forward in the public sectors, in order to bridge the implementation gap, the institutions can adopt several proven interventions from the private sector. These include structured feedback mechanisms, such as anonymous employee surveys and post-project debriefs, which can reveal latent organizational issues and promote a culture of continuous improvement. Equally applicable are initiatives that improve meeting efficiency, including standardized agendas and actionable outcomes, as well as the integration of collaborative digital platforms for visibility and workflow management. Moreover, structured recognition programs and targeted training in soft skills, particularly in feedback delivery, conflict resolution, and active listening, could enhance interpersonal trust and collective accountability. While such measures are often embedded in performance driven private sector environments, their adaptation to public administration must align with the sector's democratic values, legal constraints, and multi-stakeholder complexity. Nonetheless, importing these practices can substantially strengthen the communicative and collaborative capabilities of civil servants, ultimately improving service quality and EU fund absorption outcomes.

Ultimately, this paper underscores that strengthening communication and collaboration is not a peripheral HR concern but a strategic lever in achieving EU cohesion policy outcomes. Targeted investment in human capital, leadership development, and digital infrastructure can transform administrative culture, thereby unlocking the developmental potential of EU funds in Europe's most vulnerable regions.

6. Conclusions

This paper has demonstrated that internal communication and collaboration represent foundational capabilities for institutional performance and adaptability. Drawing on empirical data from a private sector company and contextualized through comparative analysis with EU-level public administration assessments, the paper underscores the extent to which structured communication systems, leadership accessibility, and interdepartmental coordination contribute to enhanced organizational outcomes.

While private sector organizations are progressively adopting mechanisms that foster responsiveness and inclusion, public institutions often remain encumbered by

traditional bureaucratic models. The case of Oradea City Hall serves as a compelling illustration of how targeted reforms combining physical restructuring, staff training, and procedural streamlining can yield tangible improvements in administrative quality and public service delivery.

The paper's principal contribution lies in its integrative methodological design and the formulation of diagnostic indicators for internal misalignment. By mapping employee-level insights onto broader governance frameworks, the paper facilitates the translation of operational practices from the private sector into actionable strategies for the public sphere. This approach enhances both theoretical understanding and practical application in the field of public sector reform.

In conclusion, embedding communication and collaboration as strategic competencies within public institutions is imperative. Their systematic integration into institutional processes is not only essential for achieving operational efficiency but also for reinforcing public value, fostering institutional trust, and advancing sustainable socio-economic development at regional and national levels.

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EVOLVING PATTERNS OF WORKING LIFE DURATION IN THE EUROPEAN UNION

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Abstract: *This paper examines the duration of working life in the European Union (EU) member states, showing its evolution from 2015 to 2024. The objective is to determine the trends at the EU level and the differences among each state's average number of years an employee is expected to spend in the labour market. The methodology used in preparing the study is a descriptive statistical analysis of data published by Eurostat, which uses a comparative approach of the evolution over the time period examined and the existing differences between member states. The results of the study show an increasing trend in the duration of the working life in the EU countries, but also highlight significant variations among states. The Eurostat data also reveal substantial disparities between women and men. This evolution suggests significant changes in the economic context and the dynamics of the European workforce. The conclusions highlight the necessity of finding a balance in the European labour market, in order to better understand the evolution of the labour market, especially in the context of the demographic transition.*

Keywords: *working life duration; labour market; European Union; employment; gender disparities*

JEL classification: J21; J11

1. Introduction

In recent years, the European Union has faced significant demographic challenges, such as population ageing, declining fertility rates, and increasing pressure on pension and social welfare systems. Understanding labour-market dynamics has become an important subject for both policymakers and researchers. The duration of working life (DWL) is defined as the expected number of years a person over 15 years old is expected to remain economically active. This indicator provides a crucial data for assessing the balance between economic contributors and dependents, with direct implications for the sustainability of welfare systems. Data from Eurostat show that the expected DWL across the EU has risen steadily over recent years, with substantial variation among member states (Eurostat, 2024).

Nonetheless, overall upward trends conceal the distinct structural, socioeconomic, and normative variances among nations. Elements like labour market regulations, job structures, education levels, and gender norms affect the duration of individuals' participation in the workforce. Studies have shown that working life expectancy

(WLE), a concept closely related to DWL, varies significantly by education level and occupation, with less-educated individuals often experiencing shorter working lives and earlier exit from employment (Loichinger & Weber, 2016; Chungkham et al., 2025).

Health and work quality also play a crucial role in shaping working life duration. Even as life expectancy increases, not all additional years are spent in good health or employment. The concept of healthy working life expectancy (HWLE) — the number of years individuals are both working and in good health — has gained attention as a more comprehensive indicator of sustainable employment (Boissonneault et al., 2021; Weber & Loichinger, 2022). Evidence from multiple European countries indicates that health inequalities and working conditions substantially affect HWLE, particularly among older workers (Lievre et al., 2007).

Gender remains another major factor influencing DWL and WLE. Across the EU, women continue to have shorter working life expectancies than men, reflecting persistent gaps in labour-market participation, they are prone to more part-time work, and they have different care responsibilities (Solovieva et al., 2024). Nevertheless, recent studies show that these gaps are gradually narrowing, driven by increasing female labour participation and policy efforts promoting active ageing and gender equality (Boissonneault et al., 2021).

Despite the increasing importance of the topic, comprehensive studies that examine DWL trends over the last decade across all EU member states — with attention to both regional disparities and gender differences — remain scarce. This paper addresses this gap by analyzing DWL in EU member states over a ten-year period (2015–2024), using Eurostat data (indicator *LFSI_DWL_A*). The objectives are to document recent trends and patterns at the EU level, and to explore disparities among states and between genders. Through this approach, the study contributes to understanding how demographic change, labour-market participation, health, and social policies intersect to shape the length and quality of working life in contemporary Europe.

2. Literature review

2.1. Conceptual background

The Duration of Working Life (DWL) is an indicator developed by Eurostat to measure the average number of years that a person aged 15 is expected to be economically active throughout their lifetime. It captures both the entry into and exit from the labour market, reflecting the combined effects of employment, education, retirement, and demographic change (Eurostat, 2024). The indicator is derived from the Labour Force Survey (LFS) and provides a harmonized framework for comparing member states.

According to Loichinger and Weber (2016), the concept of DWL offers a more integrated understanding of labour market participation than static indicators such as employment rates, as it incorporates longitudinal dynamics of labour engagement across generations. DWL has become particularly relevant in the context of Europe's ageing population and policy efforts to extend working lives through pension reforms, active ageing strategies, and gender equality measures (OECD, 2021).

2.2. Recent trends in the European Union

Studies based on Eurostat data show a clear upward trend in the duration of working life across the European Union over the past decade. Between 2015 and 2024, the average DWL increased from approximately 35 to over 37 years at the EU-27 level (Eurostat, 2024). This gradual rise reflects longer labour market participation, delayed retirement, and greater inclusion of women and older workers in the workforce (European Commission, 2023).

However, the trend is not uniform. Northern and Western European countries — such as Sweden, the Netherlands, and Denmark — consistently report longer DWL, often exceeding 42 years. In contrast, Southern and Eastern European countries, including Italy, Greece, and Romania, remain below the EU average (Eurostat, 2024). Loichinger and Weber (2016) and Weber and Loichinger (2022) note that such disparities are linked to differences in institutional frameworks, labour flexibility, and participation of women and older workers.

2.3. Gender disparities in DWL

Gender remains a significant dimension of DWL differences in the European Union. Across most member states, men have longer expected working lives than women, though the gap has been narrowing gradually (Solovieva et al., 2024). The gender gap in DWL is influenced by persistent inequalities in access to full-time employment, career interruptions due to family responsibilities, and structural labour market segregation (Boissonneault et al., 2021).

Empirical data show that Nordic countries, where social policies promote shared caregiving and flexible employment, have achieved the smallest gender differences in DWL. In contrast, Southern European countries continue to show pronounced disparities (Eurostat, 2024). Scholars such as Chungkham et al. (2025) argue that occupational strain, part-time employment, and job insecurity disproportionately affect women, reducing their total duration of working life.

2.4. Regional patterns and determinants

The DWL indicator also reveals a persistent geographical divide within the EU. Northern and Western member states exhibit longer working lives, supported by higher employment rates and more flexible pension systems. Eastern and Southern Europe are characterized by shorter DWL, reflecting structural barriers such as lower female participation, informal employment, and higher unemployment rates (OECD, 2021; European Commission, 2023).

Differences in DWL can also be linked to labour market institutions, education levels, and health outcomes. In countries with stronger lifelong learning systems and inclusive labour-market policies, individuals tend to remain active for longer periods. Eurostat (2024) highlights that policies encouraging older workers' participation and reducing early retirement have been particularly effective in extending DWL.

2.5. Synthesis

The literature consistently shows that the *duration of working life* in Europe is gradually increasing, but remains highly uneven across regions and genders. While policy reforms and demographic change contribute to the overall upward trend, structural inequalities — especially those related to gender, education, and employment conditions — continue to shape cross-country differences. DWL thus emerges as a key indicator for evaluating labour-market inclusiveness and the long-term sustainability of social protection systems in the European Union.

3. Data and methodology

This research is based on official data provided by Eurostat, specifically using the indicator *Duration of Working Life* (code LFSI_DWL_A), derived from the EU Labour Force Survey (LFS). The indicator represents the average number of years that a person aged 15 is expected to be economically active throughout their lifetime, taking into account the prevailing age-specific activity rates within each country.

The data used in this study are harmonized and comparable across all European Union member states, which allows for a coherent comparative analysis. Since the indicator is constructed using standardized LFS data and methodology, it ensures a high level of reliability and cross-country consistency. All datasets were extracted directly from Eurostat's public database in November 2025, thus incorporating the most recent updates available for the 2024 reference year.

The study covers a ten-year period, from 2015 to 2024, which is particularly relevant for capturing the evolution of the European labour market during a period of major social and economic transformations. This decade circles several important phases: the recovery from the global financial crisis, the demographic ageing process that has increasingly shaped policy debates, the disruption caused by the COVID-19 pandemic, and the more recent employment reforms introduced across EU member states to promote longer and more inclusive working lives. By focusing on this time frame, the analysis provides a comprehensive view of the structural and cyclical factors that influence labour participation across Europe.

The research includes all 27 member states of the European Union, corresponding to the current configuration after the withdrawal of the United Kingdom. The analysis follows two complementary perspectives. First, it examines the temporal evolution of the duration of working life at the EU level, highlighting trends and shifts observed between 2015 and 2024. Second, it explores the geographical disparities among member states, distinguishing between Northern, Western, Southern, and Eastern European countries. These two dimensions — temporal and spatial — enable a deeper understanding of both long-term patterns and regional differences in labour market behaviour.

The methodological approach adopted in this paper is quantitative, descriptive, and comparative. It aims to identify broad patterns. Descriptive statistics are used to summarize and interpret the data, focusing on changes in averages, ranges, and relative positions of member states over time. The analysis also includes a gender perspective, given the persistent disparities between men and women in terms of labour market participation and working life duration. By comparing male and female DWL values, the study seeks to highlight progress towards gender convergence and the remaining structural barriers that continue to shape employment trajectories.

All data processing steps were carried out using secondary data directly from Eurostat's online database. The dataset was cleaned and verified for completeness and consistency, ensuring that all EU-27 countries had continuous data series for the period under analysis. Average and range values were calculated to capture overall EU patterns, while graphical representations available through Eurostat's visualization tools were used to illustrate the evolution of DWL both over time and across member states.

Nevertheless, the analysis faces several methodological limitations. The *Duration of Working Life* indicator is an expected value, not an observed measure. It estimates, based on current labour participation rates, how long individuals are likely to remain active in the labour market if current patterns persist. This implies that sudden policy shifts or structural changes — for example, economic crises, pension reforms, or technological transformations — might alter future trajectories in ways not captured by current estimates. Furthermore, while the Eurostat data are harmonized, differences in national labour market structures, such as the prevalence of informal work, part-time employment, or self-employment, may influence cross-country comparability. Despite these factors, the Eurostat DWL indicator remains the most robust and internationally recognized tool for assessing the expected duration of working life in the European Union.

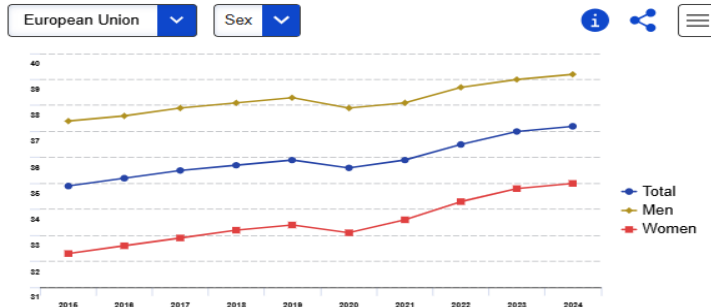
In summary, this study applies a descriptive and comparative analysis to examine the evolution and disparities of the *Duration of Working Life* across EU member states between 2015 and 2024. By relying on harmonized data and focusing on both temporal and geographical dimensions, the methodology provides a reliable foundation for understanding the dynamics of labour market participation in Europe, as well as the gender and regional inequalities that persist in the context of demographic ageing and ongoing labour market reforms.

4. Results

The analysis of Eurostat data for the period 2015–2024 reveals that the duration of working life (DWL) has continued to increase across most European Union member states, reflecting a trend towards longer economic activity and delayed labour market exit. As shown in Figure 1, the average DWL at the EU-27 level reached approximately 37.2 years in 2024, compared to around 34.9 years in 2015. This steady rise confirms that the European labour market is gradually adapting to demographic ageing and the increasing participation of both older workers and women in the labour force (Eurostat, 2024).

Expected duration of working life, 2015-2024

(years)



Source: Eurostat - [lfsl_dwl_a](#)

eurostat

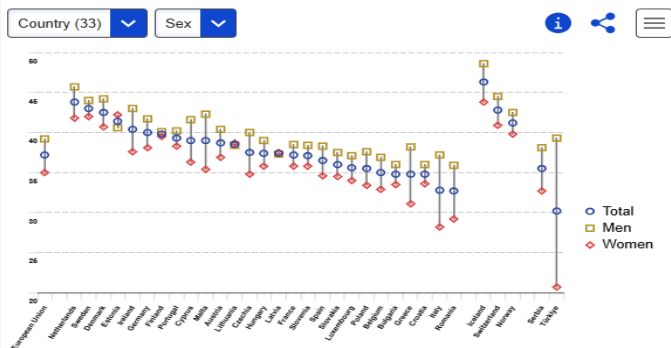
Figure 1: Evolution of Duration of Working Life in the EU, 2015–2024.

Source: Eurostat ([lfsl_dwl_a](#))

The overall upward trend can be interpreted as a combined effect of several structural forces. First, the extension of retirement ages and the reform of pension systems across many EU countries have encouraged older workers to remain active for longer periods (OECD, 2021). Second, improvements in education and life expectancy have contributed to higher participation rates throughout the working life. Third, the expansion of flexible and part-time employment arrangements has made it easier for individuals to remain in the labour market during different life stages. Nevertheless, the data reveal substantial regional disparities.

Expected duration of working life by country and sex, 2024

(years)



Source: Eurostat - [lfsl_dwl_a](#)

eurostat

Figure 2: Expected duration of working life by country and sex, 2024.

Source: Eurostat ([lfsl_dwl_a](#))

As illustrated in Figure 2, Northern and Western European countries consistently record the highest DWL values, often exceeding 42 years. Sweden (43.0), the Netherlands (42.8), and Denmark (42.5) stand out as examples of societies with inclusive labour markets and high levels of female and older-worker participation. These countries also tend to combine active ageing policies with strong welfare systems and lifelong learning programs that support continuous employability (Weber & Loichinger, 2022).

By contrast, Southern and Eastern European countries remain below the EU average. Italy (32.8 years), Greece (30.2 years), and Romania (34.8 years) display shorter expected working lives (Eurostat, 2024). The lower DWL values in these countries can be attributed to multiple structural constraints, including lower employment rates, high youth unemployment, and limited integration of women into full-time employment. In Southern Europe in particular, more rigid labour markets and traditional gender norms tend to discourage prolonged participation, while in Eastern Europe, economic instability and migration dynamics continue to affect the sustainability of national labour forces.

The geographical pattern, visualized in Figure 3 as a map of Europe, shows a clear North–South divide, with Northern and Western countries forming a cluster of longer working lives and Southern and Eastern countries lagging behind. This persistent divergence aligns with previous studies highlighting that DWL is not only a function of demographic factors but also of institutional and cultural contexts (Loichinger & Weber, 2016; European Commission, 2023).

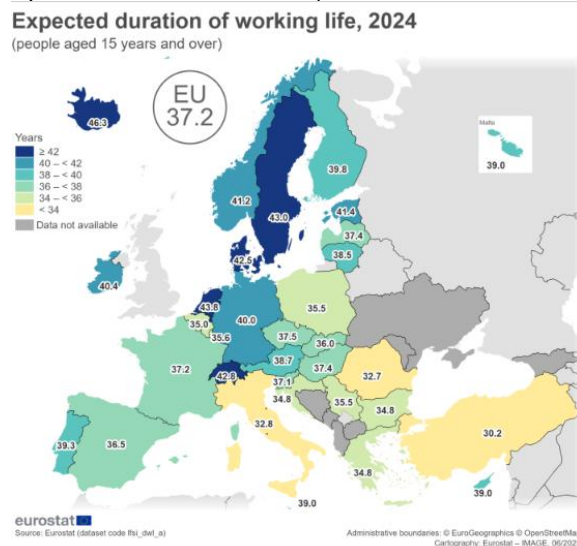


Figure 3: Geographic Distribution of DWL in Europe.

Source: Eurostat ([lfsi_dwl_a](#))

A more detailed examination by gender provides further insights. As seen in Figure 4, the DWL indicator remains higher for men than for women in every EU member state, although the gender gap has narrowed slightly over the past decade. In 2015,

the average difference between men and women in the EU-27 was about 4.9 years, whereas by 2024 it had decreased to approximately 4.1 years (Eurostat, 2024). The reduction of this gap reflects broader social changes, including improvements in female education levels, increased childcare support in several member states, and EU initiatives promoting gender equality in employment (Solovieva et al., 2024).

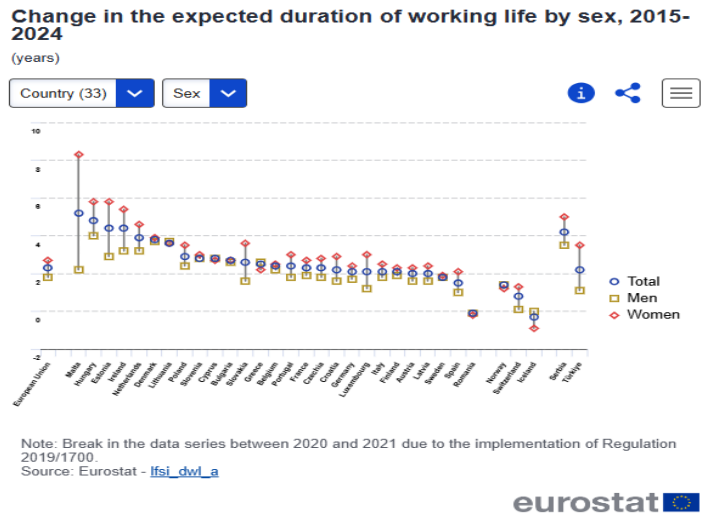


Figure 4: Change in the expected duration of working life by sex, 2015–2024.
Source: Eurostat ([lfsi_dwl_a](#))

However, the narrowing of the gender gap is far from uniform. In Nordic countries such as Sweden and Finland, the difference between men and women is now less than two years, while in Southern and Eastern Europe it remains substantially larger — exceeding six years in countries such as Italy, Greece, and Romania. These persistent disparities suggest that structural barriers continue to limit women's capacity to maintain long and stable employment trajectories. In particular, unequal access to full-time work, cultural expectations surrounding family responsibilities, and gendered labour segregation continue to constrain the DWL of women compared to men (European Commission, 2023).

When observing the temporal evolution, the most rapid increases in DWL occurred between 2017 and 2019, coinciding with the post-crisis economic recovery and growing labour market participation. The period 2020–2021 reflects a temporary stagnation due to the COVID-19 pandemic, when employment interruptions and early retirements affected several labour markets. Yet, by 2022–2024, most EU countries had resumed their upward trajectory, suggesting a return to long-term growth in labour force participation.

From a policy perspective, these results underline the importance of maintaining a balance between extending working lives and ensuring the quality and sustainability of employment. While the extension of professional life can alleviate demographic

and fiscal pressures, it may also expose older and vulnerable workers to higher risks of precarious employment or deteriorating health if not accompanied by adequate support measures (Weber & Loichinger, 2022; OECD, 2021).

The comparative evidence also indicates that countries with comprehensive active ageing strategies — combining training, flexible retirement options, and inclusive social policies — are more successful in achieving both longer and healthier working lives. In contrast, member states where labour market participation is uneven or dependent on rigid institutional structures continue to face lower DWL values and wider gender disparities.

The analysis of Eurostat data for 2015–2024 demonstrates that the duration of working life in the European Union has gradually increased, but remains highly uneven across regions and between genders. Northern and Western Europe lead the trend towards longer working lives, while Southern and Eastern Europe lag behind due to structural and institutional challenges. Gender gaps, although narrowing, persist as a major source of inequality in the European labour market. These findings emphasize the need for continued policy efforts to promote equal access to employment opportunities and to create flexible and sustainable pathways for extending working life across all population groups.

5. Policy implications and future outlook

The results of this analysis highlight the growing importance of policies that promote longer, healthier, and more inclusive working lives within the European Union. The gradual increase in the duration of working life (DWL) observed between 2015 and 2024 suggests that labour markets are adjusting to demographic ageing, yet the persistent regional and gender disparities underline that these changes are neither uniform nor equitable. Consequently, effective policy responses must go beyond the simple extension of retirement ages and address the structural factors that condition participation throughout the life course.

At the European level, several strategic frameworks have already acknowledged the centrality of extending working life. The European Pillar of Social Rights and the EU Green Deal both emphasize the need for inclusive labour markets capable of integrating diverse age groups and skill levels. Moreover, the European Employment Strategy promotes active ageing, lifelong learning, and flexible working arrangements as key elements in improving labour market resilience (European Commission, 2023). However, implementation remains uneven across member states. In Northern and Western Europe, where employment policies are more adaptive and welfare systems stronger, these measures have translated into higher DWL values. In contrast, Southern and Eastern European countries continue to struggle with rigid labour structures, lower employment rates, and limited policy coordination.

Gender equality policies remain a particularly critical area of intervention. The narrowing of the DWL gap between men and women is encouraging, yet the persistence of differences in many member states indicates that additional reforms are required. Policies that expand affordable childcare, promote shared parental leave, and ensure equal access to full-time employment opportunities have proven

effective in increasing women's labour market participation (Solovieva et al., 2024). Furthermore, promoting lifelong career development and combating occupational segregation can reduce interruptions in women's working lives, thereby contributing to both gender equality and the sustainability of labour markets.

The results also suggest that extending working life must be balanced with the quality of employment and health conditions of older workers. Merely increasing the statutory retirement age without improving working conditions risks exacerbating social inequalities and creating negative health outcomes among vulnerable groups (OECD, 2021; Weber & Loichinger, 2022). Active labour market policies should therefore focus on improving access to training and re-skilling opportunities for older employees, promoting flexible or phased retirement, and encouraging age-friendly workplaces. These measures can help ensure that longer working lives are also sustainable and productive.

Looking forward, the digital and green transitions present both challenges and opportunities for Europe's working-age population. Automation and new technologies may shorten traditional career paths for some workers while creating new opportunities for others. At the same time, the transition to a greener economy is expected to generate new labour demands and skills needs. In this context, maintaining and extending the duration of working life will require proactive investment in digital literacy, vocational requalification, and adaptive lifelong learning systems (European Commission, 2023).

From a demographic perspective, the continued rise of DWL represents a vital counterbalance to population ageing. However, to sustain this trend, policies must simultaneously enhance employment inclusivity and ensure intergenerational equity. Encouraging the participation of underrepresented groups—such as women, young people, migrants, and older workers—remains key to maintaining a stable and productive labour force.

6. Conclusion

This paper has analyzed the evolution and disparities of the duration of working life (DWL) across the European Union over the period 2015–2024, using harmonized Eurostat data (indicator *LFSI_DWL_A*). The results confirm a steady and significant increase in the expected duration of working life across the EU-27, indicating that individuals are remaining economically active for longer periods. This trend reflects both structural adjustments in labour markets and the demographic imperative to sustain economic activity in ageing societies.

However, the analysis also demonstrates that this upward trajectory is uneven across countries and genders. Northern and Western European states, such as Sweden, the Netherlands, and Denmark, continue to exhibit the longest expected working lives—often exceeding 42 years—supported by comprehensive welfare systems, flexible labour-market institutions, and strong gender equality policies. In contrast, Southern and Eastern European countries, including Greece, Italy, and Romania, remain below the EU average, reflecting persistent structural and institutional barriers.

Gender disparities, although gradually narrowing, persist across all member states. Men continue to have longer expected working lives than women, but the gender gap has decreased over the past decade, particularly in countries with inclusive labour policies and robust childcare systems. These findings suggest that progress toward gender equality in employment remains a key driver of extended working life and labour-market sustainability.

From a policy perspective, the results underscore the importance of a comprehensive approach to managing demographic change. Extending the duration of working life cannot rely solely on raising retirement ages; it must also involve improving working conditions, promoting lifelong learning, and supporting active ageing through targeted employment policies. At the same time, efforts to ensure gender equality, fair access to employment, and the inclusion of older workers are crucial for achieving balanced and equitable labour participation across Europe.

The findings also carry broader implications for the sustainability of social protection systems and the competitiveness of European economies. By increasing the duration of working life, EU member states can strengthen the ratio between active and dependent populations, thereby mitigating some of the fiscal pressures of ageing. However, these gains will only be sustainable if accompanied by policies that ensure quality employment and protect the health and wellbeing of workers throughout their careers.

In conclusion, the European Union is moving towards a model of longer, more inclusive, and potentially more resilient working lives, yet substantial differences persist. Bridging these divides requires coordinated efforts at both national and EU levels, aimed at harmonizing labour-market participation, fostering gender equality, and promoting active ageing. Future research should build on this analysis by exploring the interaction between DWL, health outcomes, and technological change, as these factors will play an increasingly decisive role in shaping Europe's labour markets in the decades ahead.

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ARTIFICIAL INTELLIGENCE AND THE TRANSFORMATION OF HUMAN RESOURCE DEVELOPMENT

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Abstract: *Artificial intelligence is profoundly reshaping Human Resource Development by transforming how organizations design learning systems, cultivate talent and sustain continuous professional evolution. AI technologies now support adaptive learning pathways, automated content generation, personalized feedback, predictive analytics and virtual coaching, enabling HRD processes to become more responsive, scalable and data-driven. Methodologically, this study adopts a structured conceptual synthesis based on peer-reviewed literature published between 2018 and 2025. Despite the opportunities introduced by AI, its impact remains uneven and highly dependent on organizational digital readiness, data quality, learning culture and ethical governance. The analysis identifies several emerging transformations, including the rise of intelligent learning ecosystems, emotion-aware developmental support, algorithmic talent analytics and augmented knowledge management. At the same time, AI introduces significant risks such as reduced learner autonomy, techno-stress, opaque decision mechanisms, surveillance concerns and the potential amplification of digital inequalities. The paper advances a human-centered conceptual perspective that positions HRD as a critical mediator between employees and algorithmic systems, responsible for ensuring fairness, accountability and psychological safety. The conclusions outline theoretical and practical implications for designing ethical and inclusive AI-enabled HRD environments and propose future research directions focused on cross-country adoption patterns, algorithmic auditing, hybrid human-AI collaboration and the development of equitable digital learning infrastructures.*

Keywords: *Artificial intelligence; Human Resource Development; Digital skills; Talent management; Adaptive learning; Ethical governance*

JEL Classification: *M12; O15; O33; M53*

1. Introduction

Artificial intelligence has become a defining force in contemporary organizational transformation, reshaping the ways individuals acquire, retain and apply knowledge in environments characterized by rapid technological change. At the European level, this evolution is framed by strategic policy initiatives such as the Digital Europe Programme, the European Skills Agenda, the Digital Decade objectives and the Artificial Intelligence Act, all of which emphasize the urgent need to strengthen digital competencies and ensure the ethical governance of high-risk algorithmic systems. In parallel, the transition toward Industry 5.0 shifts the focus of technological development toward human-centricity, resilience and sustainable value creation,

underscoring the importance of development systems that augment human potential rather than replace it. Within this broader transformation, Human Resource Development has become one of the most strategically significant organizational functions. AI-enabled systems now personalize learning pathways, identify evolving skill needs, support adaptive training, provide real-time feedback, and generate predictive insights for shaping long-term talent strategies. Intelligent tutoring systems, learning analytics, virtual mentoring technologies and generative AI assistants contribute to increasingly dynamic learning ecosystems that respond to individual performance patterns and organizational development priorities. These innovations hold the potential to enhance the scalability, inclusiveness and relevance of professional development, enabling organizations to build workforces capable of navigating digital transformation and sustaining employability in volatile labour markets. Despite these opportunities, the integration of artificial intelligence into HRD raises considerable challenges. Research highlights persistent concerns regarding algorithmic bias, unequal access to digital learning infrastructures, intrusive data extraction, reduced learner autonomy and the erosion of motivational and relational dimensions of development. The EU AI Act classifies AI systems used in recruitment, assessment and worker management as high-risk technologies, signaling their ethical sensitivity and the need for strong governance structures. As a result, HRD must operate simultaneously as an adopter of technological innovation and as a safeguard responsible for ensuring that AI-based learning processes remain fair, transparent and aligned with principles of human dignity and organizational justice. The problem addressed in this study arises from the mismatch between the theoretical promise of AI-enabled HRD and the uneven outcomes observed in practice. While organizations widely adopt AI to support learning and development, empirical evidence on its effectiveness remains fragmented, and conceptual clarity about the pathways through which AI shapes developmental outcomes is still limited. Existing literature often focuses on technological optimization without incorporating the socio-technical dynamics that determine whether AI fosters or undermines employee growth. This gap reveals the need for a deeper conceptual understanding of how digital competencies, organizational learning culture, inclusiveness and ethical governance interact to shape AI-driven HRD. The purpose of this study is to develop an integrated conceptual framework that explains the mechanisms through which artificial intelligence influences HRD processes and outcomes. The analysis seeks to clarify the conditions under which AI enhances skill acquisition, adaptability, talent development and continuous learning, and the circumstances under which it produces risks or unintended consequences. The study offers multiple contributions. Theoretically, it synthesizes insights from HRD, information systems, organizational behaviour and European regulatory frameworks to establish a coherent conceptual foundation for understanding AI-enabled development. It advances conceptual clarity by identifying the mediating role of digital competencies and the moderating influence of ethical governance and learning culture in shaping AI outcomes. Practically, it provides guidance for HRD professionals seeking to design inclusive, transparent and ethically robust AI-driven development systems. From a policy perspective, the study aligns HRD implications with the EU AI Act and European skills policies, offering direction for strengthening digital capability building at societal level. The research objective is to conceptualise the relationship between AI

adoption, digital competencies and HRD outcomes by identifying the mediating and moderating mechanisms that shape the effectiveness of AI-based learning systems.

2. Theoretical background

Artificial intelligence has become a central force in reshaping Human Resource Development, influencing how organizations design learning processes, cultivate talent and build workforce capability. AI technologies have expanded HRD from traditional instructional functions toward integrated, data-driven ecosystems capable of supporting continuous, personalized and strategically aligned development. As contemporary organizations deploy adaptive learning platforms, intelligent tutoring systems, generative AI assistants, predictive analytics engines and algorithmic career pathway tools, development is increasingly mediated by systems that diagnose learning needs, anticipate skill gaps and guide individual learning trajectories. This shift signals a transition from procedural digitalization toward cognitive augmentation, in which AI alters not only the efficiency of learning systems but also the meaning, experience and distribution of developmental responsibilities. The conceptual foundations of AI-enabled HRD derive from several theoretical frameworks that explain how technology interacts with human development processes. Human Capital Theory emphasizes that learning and skill accumulation are strategic investments shaping employability and organizational performance. Within AI-mediated environments, this logic strengthens the role of digital literacy, data interpretation skills and algorithmic awareness as critical components of modern human capital. The socio-technical systems perspective further highlights that AI effectiveness depends not merely on technological sophistication but on alignment with organizational culture, communication structures, leadership behaviour and ethical governance. Even sophisticated adaptive learning systems may fail to produce meaningful outcomes when employees distrust algorithms, lack the digital competence to engage with AI-based tools or work in environments that do not support experimentation and continuous learning. Hybrid intelligence theory contributes additional conceptual depth by positioning AI-enabled HRD as a collaborative cognitive architecture in which machine computation and human judgment complement one another. AI systems contribute scalability, pattern recognition and real-time feedback, while human actors provide contextual interpretation, ethical reasoning, empathy and creative problem-solving. In development contexts, hybrid intelligence becomes visible in blended learning models that integrate AI-generated insights with human mentorship, dynamic feedback loops and virtual simulation environments. Theoretical insights across HRD, organizational psychology and information systems research converge in demonstrating that these hybrid systems do not diminish the role of HRD professionals; rather, they elevate the significance of interpretive, relational and supervisory capabilities. The empirical literature reinforces these conceptual insights by demonstrating that AI reshapes the cognitive, social and emotional dimensions of HRD. Research documents that automation increasingly supports higher-order developmental functions such as competency mapping, behavioural analytics, adaptive feedback and personalized coaching. Scholars emphasize that automation does not simply remove routine tasks but reconfigures them, shifting professionals' responsibilities toward data interpretation, algorithmic oversight and governance-

oriented activities. Studies also identify socio-psychological implications: AI-mediated feedback influences motivation, self-efficacy and autonomy, while inappropriate design or opaque algorithmic reasoning can generate digital fatigue, skepticism or dependency. Ethical and governance considerations represent another dominant strand of scholarship. The literature identifies risks such as algorithmic bias, intrusive monitoring, lack of explainability and reduced learner autonomy. Studies show that AI-driven learning analytics can replicate historical inequalities, while excessive behavioural tracking may blur boundaries between development and surveillance, undermining psychological safety. The EU Artificial Intelligence Act heightens these concerns by classifying AI systems used in worker management and skills assessment as high-risk, requiring strict documentation, transparency and human oversight. Scholars argue that responsible AI-enabled HRD requires governance frameworks grounded in fairness, inclusiveness and human-centered design. AI-driven continuous learning is also a central focus of the literature. Adaptive learning platforms personalize training at scale, while generative AI chatbots, virtual tutors and immersive simulations support experiential learning. Knowledge management studies further suggest that although AI accelerates knowledge codification and retrieval, it can reduce opportunities for collaborative meaning-making, relational learning and reflective practice. The Table 1 summarizes the central constructs included in this model conceptual framework while the Figure 1 illustrates the mediated and moderated relationships between AI technologies, digital competencies and HRD outcomes.

Construct	Description	Role in Framework
Artificial Intelligence	Adaptive learning, analytics, automation	Predictor
Digital Competencies	Data literacy, AI skills, self-efficacy	Mediator
Ethical Governance	Transparency, fairness, oversight	Moderator
Inclusiveness	Accessibility, equal opportunities	Moderator
Learning Culture	Supportive climate, openness	Moderator
HRD Outcomes	Learning performance, engagement, employability	Dependent Variable

Table 1: Summary of Key Constructs in the Conceptual Framework

Source: Data gathered by the author through the literature review process.

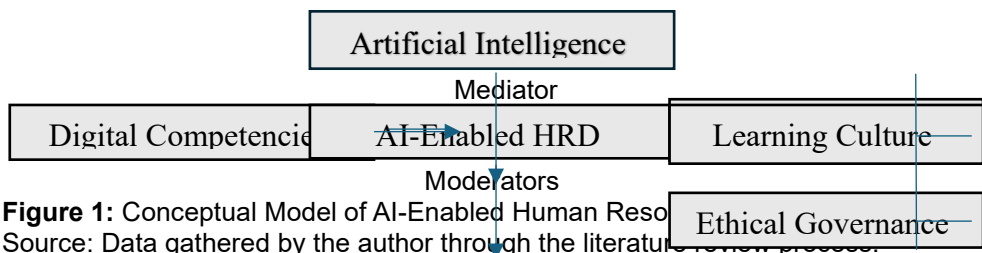


Figure 1: Conceptual Model of AI-Enabled Human Resource Development

Source: Data gathered by the author through the literature review process.

Finally, the literature on hybrid intelligence provides an integrative lens for understanding how AI reshapes HRD outcomes. Hybrid systems enhance responsiveness, decision quality and developmental coherence but also introduce new tensions such as algorithmic dependency, reduced autonomy and the emergence of “shadow practices” where learners circumvent system constraints. These findings align with organizational behaviour research, which shows that technology-mediated environments redistribute power, challenge norms of professional judgment and require new forms of cognitive and emotional resilience. Together, these conceptual foundations and empirical insights demonstrate that AI-enabled HRD represents a transformative shift in how organizations support learning, capability building and talent development. The evidence consistently indicates that AI influences HRD outcomes through mediated mechanisms such as digital competence and moderated effects shaped by ethical governance, inclusiveness and organizational learning culture. These converging findings establish the basis for the integrated analytical framework advanced in this study and provide the theoretical bridge to the methodological approach presented in the next section.

3. Research Methodology

This research adopts a conceptual and theory-building approach with the aim of consolidating current understanding of the interplay between artificial intelligence and Human Resource Development (HRD). Unlike empirical studies that collect primary data, a conceptual study seeks to integrate theoretical insights, uncover patterns across disciplines, and formulate analytically grounded propositions to inform future empirical research. The methodology is guided by structured conceptual synthesis, which combines systematic literature mapping with interpretive analysis to offer a coherent account of how AI influences HRD processes, skill development, and organizational learning dynamics. The literature used for this study was identified through a structured search protocol applied across major academic databases, including Scopus, Web of Science, ScienceDirect, Emerald Insight and Wiley Online Library. The search targeted peer-reviewed journal articles published between 2018 and 2025, corresponding to the period during which AI adoption in HRD accelerated significantly. Search terms included combinations of “artificial intelligence”, “human resource development”, “digital skills”, “adaptive learning”, “learning analytics”, “talent development”, “algorithmic HRM”, “hybrid intelligence” and “ethical HRD”. Additional policy documents from the European Commission, OECD and UNESCO were included to capture the regulatory and socio-economic context shaping AI-enabled development systems. The inclusion criteria prioritized studies that explored AI-driven learning, development, training, competency assessment, or talent analytics, considered socio-technical aspects such as digital literacy, organizational culture, or governance structures, examined ethical considerations related to AI in developmental or employee-facing contexts, and offered theoretical, conceptual, or empirical insights relevant to HRD. Studies were excluded if they focused exclusively on operational HR activities, such as payroll automation, purely technical AI engineering, or contexts unrelated to learning and competency development. The resulting literature corpus comprised 110 articles and policy documents that met these criteria. The analysis was carried out in three

stages. It began with a descriptive mapping of themes to identify key research areas across HRD, organizational behavior, information systems, knowledge management, and educational psychology. This was followed by an interpretive thematic analysis to synthesize patterns related to automation, competencies, governance, learning systems, and human-AI collaboration. Finally, cross-disciplinary insights were integrated to develop an explanatory conceptual framework linking AI adoption to HRD outcomes through the mediating role of digital skills and the moderating effects of learning culture, inclusiveness, and ethical governance. This approach allows for a rigorous, theoretically grounded understanding of AI-enabled HRD while acknowledging the absence of primary empirical validation.

4.1. Synthesis of Findings

The synthesis of existing literature reveals that, despite rapid growth in research on artificial intelligence within Human Resource Development (HRD), the field continues to exhibit substantial conceptual, empirical and methodological gaps. A major limitation concerns the limited availability of large-scale or longitudinal empirical studies capable of validating claims regarding AI's impact on learning effectiveness, capability development or behavioural outcomes. Much of the current research remains exploratory, relying on conceptual analyses, expert commentary or isolated case studies, resulting in fragmented evidence and inconsistent conclusions. A persistent implementation gap is also evident between the advanced AI capabilities emphasized in academic discourse—such as adaptive emotion-sensitive learning systems, metaverse-based simulations or AI-driven career pathways—and the comparatively low technological maturity found in organizational HRD practice. Many organizations continue to struggle with fragmented data systems, low-quality datasets and insufficient digital infrastructure, thereby limiting the real-world applicability of scholarly models. This disconnect suggests that AI-enabled HRD remains aspirational in many contexts, and that adoption challenges require deeper theoretical and empirical analysis. Another recurring finding concerns the absence of coherent, operational standards for responsible AI use in HRD. Although the EU Artificial Intelligence Act establishes a governance structure for high-risk AI systems, concrete regulatory guidance on algorithmic transparency, fairness in developmental recommendations, auditing procedures and explainability remains limited. This lack of harmonized standards restricts cross-country comparability and complicates organizational compliance. In addition, evidence highlights the underexplored ethical, emotional and psychological dimensions of AI-enabled HRD. Despite frequent recognition of risks such as algorithmic bias, surveillance perceptions, privacy concerns and reductions in learner autonomy, empirical studies examining trust, fairness perceptions, acceptance, techno-stress or emotional responses to AI-driven feedback remain limited. This gap reflects broader deficiencies in understanding how AI shapes identity, psychological safety and relational learning dynamics. Finally, methodological challenges persist, particularly regarding the use of learning analytics and multimodal data. Although AI generates large volumes of behavioural and performance data, many studies rely on incomplete datasets, narrow samples or descriptive analyses, limiting the potential for robust conclusions. Together, these findings underscore the need for more comprehensive,

interdisciplinary and empirically grounded research to support responsible and equitable AI-enabled HRD.

4.2. Critical Discussion

The integration of artificial intelligence into Human Resource Development represents a significant socio-technical transformation that extends well beyond mere technology adoption. AI serves both as a facilitator of personalized, scalable, and data-driven development and as a source of new challenges related to autonomy, fairness, and identity. Its impact is shaped by organizational digital maturity, governance structures, and socio-psychological factors within the workplace. A recurring theme in the literature is the emergence of “shadow experiences,” where employees develop unintended coping behaviors in response to AI-driven learning environments. These behaviors include skepticism toward algorithmic recommendations, emotional disengagement, avoidance strategies, and workarounds to bypass system limitations. Such experiences often arise from opaque algorithms, limited human oversight, or perceived surveillance, highlighting the importance of trust and psychological safety in AI-mediated development. AI also reshapes HRD structurally, elevating it from an administrative function to a strategic domain driven by predictive analytics, talent intelligence, and dynamic capability planning. Organizations with advanced digital infrastructures use AI to anticipate skill needs, tailor learning pathways, and inform evidence-based decisions on internal mobility and succession planning. In contrast, organizations with lower digital readiness face role ambiguity, inconsistent outputs, and widening skill gaps. This illustrates how AI amplifies existing strengths while exposing latent weaknesses, emphasizing the need for socio-technical alignment. The rise of predictive analytics and talent intelligence further enhances HRD's strategic importance but introduces ethical and governance challenges. Algorithmic bias, privacy concerns, and discriminatory recommendations necessitate transparent design, rigorous auditing, and clear accountability. HRD must balance AI's analytical advantages with measures that protect fairness and autonomy. Hybrid intelligence emerges as a key concept, framing AI as a complement rather than a replacement for HRD professionals. AI provides real-time pattern recognition, scalability, and personalized feedback, while humans contribute ethical judgment, contextual understanding, and relational support. Successful AI-enabled HRD depends on this synergy between technology and human expertise. Nevertheless, AI implementation can exacerbate inequalities if inclusivity is not prioritized. Employees with limited digital literacy may experience reduced autonomy, confidence, or access to advanced learning systems. This underscores the importance of equitable development opportunities and supportive learning cultures to ensure all employees benefit from AI.

4.3. Theoretical Contributions

This study advances the theoretical understanding of AI-enabled HRD by proposing an integrated socio-technical framework that explains how digital competencies, organizational inclusiveness, learning culture and ethical governance interact to shape developmental outcomes. It contributes to theory-building by synthesizing multiple streams of research-HRD, information systems, organizational behavior, ethics and learning analytics-into a unified perspective on AI-driven capability

formation. A key theoretical contribution is the articulation of hybrid intelligence within HRD, emphasizing the complementary cognitive roles of AI systems and human professionals. This study positions digital literacy, algorithmic awareness and ethical reasoning as core components of modern human capital, thereby expanding existing models of digital competence. The conceptual model clarifies why AI adoption produces heterogeneous outcomes, highlighting the role of contextual moderators such as governance quality, organizational readiness and inclusiveness. By bridging socio-technical systems theory, human capital theory and emerging frameworks on human-machine collaboration, the study offers a deeper understanding of how AI reshapes professional identity, autonomy and learning dynamics.

4.4. Practical Implications

Practically, the study offers actionable guidance for HRD practitioners tasked with integrating AI into learning ecosystems. Organizations should develop structured digital capability frameworks that enable employees to critically interpret and supervise algorithmic outputs, rather than relying passively on automated feedback. Transparent governance mechanisms-including explainability tools, algorithmic audits and model documentation-are essential to maintain trust and ensure fairness in AI-mediated development. The findings emphasize the importance of combining AI-driven personalization with human mentoring, reflective practice and relational learning support. AI systems must be embedded in inclusive learning cultures that promote experimentation, feedback-seeking and psychological safety. HRD professionals should also implement interventions that address digital divides, ensuring equitable access to AI-enhanced opportunities across demographic and occupational groups. At the policy level, the study underlines the need for stronger regulatory guidance aligned with the EU AI Act, particularly concerning interoperability, ethical design, algorithmic transparency and equitable access to digital learning infrastructures. Collaboration among policymakers, professional bodies, educational institutions and organizations is essential for building sustainable and responsible AI-enabled HRD systems.

4.5. Limitations and future research directions

This study is conceptual and does not provide empirical validation for the relationships proposed within the framework. Although the literature review is comprehensive, it is not systematic and may overlook emerging empirical evidence, especially in rapidly evolving areas of AI technology. The generalizability of the framework's propositions may vary depending on sector, organizational size, and national regulatory context, given differences in digital maturity and readiness. The continuously evolving regulatory landscape introduces uncertainty regarding governance requirements for AI-enabled HRD systems. Many operational standards for adaptive learning, algorithmic auditing, and talent analytics are still under development, which may limit the practical applicability of some recommendations over time. Future research should empirically test the proposed framework through large-scale surveys, experiments, case studies, and mixed-methods approaches. Comparative cross-country studies would provide insight into how different regulatory, institutional, and cultural contexts shape AI adoption in HRD. Investigations should also address the digital divide in AI-mediated learning,

exploring how demographic, socio-economic, and occupational factors affect access to developmental opportunities. Longitudinal studies could examine the impact of AI on skill acquisition, professional identity development, and employability over time. Additionally, psychological aspects such as trust, algorithmic transparency, learner autonomy, techno-stress, and perceived fairness require further attention, as they are critical for engagement and learning outcomes. Methodological innovation is essential, including the use of learning analytics, natural language processing, multimodal behavioral data, and algorithmic auditing techniques. Interdisciplinary collaboration among HRD, data science, behavioral psychology, and public policy will be crucial to advance responsible, human-centered AI systems.

5. Conclusion

Artificial intelligence is fundamentally transforming Human Resource Development, reshaping how organizations diagnose skill needs, personalize learning trajectories and support long-term employability. This study shows that AI functions not only as a technological enhancer but as a systemic force that redefines the cognitive, social and organizational mechanisms underpinning development. By integrating predictive analytics, adaptive learning pathways and intelligent coaching systems, AI increases the capacity of HRD to deliver scalable, timely and personalized learning experiences, while simultaneously raising concerns regarding fairness, transparency and digital inclusion. The findings underscore that AI's impact is deeply contingent on organizational conditions. Digital literacy, technological readiness, ethical governance and inclusive learning cultures emerge as critical determinants of whether AI strengthens or undermines developmental processes. As intelligent systems become embedded in HRD infrastructures, the role of professionals shifts toward supervising algorithmic decision-making, contextualizing automated insights and safeguarding ethical and equitable use. AI, therefore, does not replace human judgment but heightens the need for interpretive reasoning, empathy and responsible leadership. Strategically, organizations must invest in advanced digital competencies, transparent algorithmic auditing and adaptive upskilling initiatives, ensuring that AI-enabled learning systems do not amplify inequalities or bias. Policymakers also play an essential role by enforcing regulatory frameworks such as the European Artificial Intelligence Act, which provides standards for transparency, accountability and data protection in worker development. Future research should deepen empirical evidence on AI-enabled learning outcomes, assess algorithmic bias in training systems and explore the psychological and identity-related effects of AI adoption. Ultimately, the future of HRD will depend on the capacity of organizations to balance technological innovation with ethical principles, inclusiveness and sustainable human growth. In an increasingly algorithmic learning ecosystem, HRD must remain the human anchor that ensures purpose, fairness and long-term developmental integrity.

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DEVIAN ORGANISATIONAL BEHAVIOUR FROM A PERSONALITY PERSPECTIVE – SYSTEMATIC LITERATURE REVIEW

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Abstract: *The aim of our study is to provide insight into a phenomenon that can be considered deviant organizational behaviour, which is not often highlighted in the field of management, namely work addiction within an organizational framework, primarily from a personality perspective. Research on work addiction typically approaches the problem from a psychological perspective, but the phenomenon itself goes far beyond the individual level, as it has a significant impact on both the health and quality of life of employees and the functioning and effectiveness of organizations. The presence of work addiction in an organization affects a number of key areas, including performance, workplace climate and work-life balance. As employees are one of the most valuable resources of an organization, virtually all organizational factors based on the human factor may be affected. Therefore, we considered it important to review the results of research on work addiction in a context where it is already present, with a specific focus on the organizational context, placing particular emphasis on the examination of personality. Following the PRISMA procedure, the study presents a systematic literature review of the personality factors associated with work addiction in an organization, the organizational circumstances that influence workaholism through personality, and the consequences of workaholism in an organization. Based on more than forty thousand publications, after specific screening and evaluation, 295 studies were selected and reviewed, of which we summarize the findings of 31 articles in order to gain a better understanding of the personality issues underlying work addiction within organizational frameworks. According to our results, research on workaholism in the field of management appears to be expanding. There is no certainty that work addiction is determined by personality, but there are workplace conditions that can specifically lead to an increase in work addiction. When personal predisposition and reinforcing workplace conditions come together, work addiction can clearly emerge in the organization, the effects of which we will also examine. Overall, perfectionism, narcissistic and neurotic traits play a major role in work addiction, but inadequate salary, lack of feedback, or excessive accountability all contribute to the strengthening of work addiction. In such organizations, job satisfaction is decreased, workplace conflicts are more frequent, stress is higher, and the risk of burnout is greater. The results of our research are beneficial reviewing and applying by managers and human resources professionals in order to achieve organizational success.*

Keywords: *systematic literature review, work addiction, personality*

JEL Classification: M12, I12

1. Introduction

In today's global and constantly changing work environment, increasing attention is being paid to employee behaviour, which is not helped in the slightest by deviant behaviour within the organization, which can directly or indirectly damage workplace performance and the organizational atmosphere. Work addiction is a phenomenon that may initially seem positive for the organization, as the individuals concerned invest a great deal of time and energy in their work. However, research shows that work addiction is often associated with certain personality traits, such as perfectionism, narcissistic traits or type A personality, which can have a negative impact on organizational functioning and employee well-being (Clark et al., 2016). The relationship between personality and work addiction is particularly important because these factors can lead to behaviours that deviate from what are considered ideal organizational norms and are described in the literature as deviant organizational behaviour. Such behaviours may include, for example, disregarding rules, fomenting conflicts between colleagues, or unethical behaviour in the workplace, all of which can damage organizational culture and performance. In today's global, rapidly changing workplace environment, increased expectations are placed on employees, which can contribute to the spread of work addiction and related adverse organizational behaviours. Therefore, it is important to thoroughly examine the relationship between personality and work addiction in the field of management so that organizations can take more effective action against harmful behaviours and support the health and well-being of their employees. In this study, we undertake to review the relevant literature and summarize the personality factors underlying work addiction in an organizational context, the working conditions that influence work addiction, and the effects that work addiction can have on an organization.

2. Theoretical Background

Deviant organizational behaviour is behaviour that is different from organizational norms and rules and has a detrimental effect on the functioning of the organization or its employees (Di Stefano, Scrima & Parry, 2019). Although the harmful effects of organizational deviant behaviour may seem obvious, it is still present in organizations, and management and human resources professionals should focus on identifying and eliminating it. There are forms of deviant organizational behaviour that are easier to identify because they have an apparent impact, such as open violations of rules or norms (e.g. stealing, damage, aggression, social exclusion, etc.). These are easier to recognize for society or the environment (Di Stefano, Scrima & Parry, 2019). However, there are also deviant organizational behaviours that do not have directly tangible consequences because they cannot be directly linked to the behaviour in question in terms of time and space, only becoming apparent later, or, on the contrary, appearing to serve the interests of the organization. Work addiction may be one such factor, which is welcome in the short term but has undesirable effects in the long term, both for the organization and for

the individual. Work addiction is a compulsive work pattern in which an individual devotes excessive time and energy to work, often at the expense of health, family life or social relationships. It is not exclusively a matter of a heavy workload, but also of a compulsive focus on work and the resulting stress (Clark et al., 2016). Today's modern work environment is transforming the attitude of employees towards work, making work addiction an increasingly important issue worldwide (Gillet et al., 2017). Furthermore, it is also conceivable that factors prevailing within the organization itself may partly trigger these unfavorable behavioural manifestations, including work addiction. An internal factor of this kind may also be organizational culture. Based on Filep's (2019) cultural analysis, employees of the examined organization operating in the competitive sector would prefer to replace the market culture with a more people-oriented clan culture. However, for a profit-oriented service organization, this direction may not be entirely feasible or desirable, as a market-oriented approach is also necessary to maintain efficiency. Nevertheless, even if a change in organizational culture is not possible, based on the findings of Dajnoki et al. (2021), in organizations with a similar profile, leaders should pay special attention to maintaining and enhancing employee motivation by providing opportunities for continuous professional development as well as space for independent and creative work. However, in addition to workplace conditions, individual characteristics and personality differences are also responsible for the development of work addiction. It is therefore crucial to examine the personalities of those working in the organization, as this helps to understand the behaviour, motivation and work addiction tendencies of employees (Sharma, Sharma, 2011). This allows for the development of more effective human resource strategies and workplace support (McIlveene, Davis & O'Sullivan, 2024). There are several ways to learn about the personalities of employees, but the assessment is usually done using psychological tests and questionnaires that reveal, for example, the role of internal control and perfectionism (Gholipour, Nargesian & Tahmasbi, 2008), which helps to identify work addiction.

3. Methodology

We chose PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) systematic literature analysis as the methodology for our research, considering that this procedure is very useful and widespread among researchers for summarizing concepts and correlations in the literature (Flavia, 2024). It ensures high-quality reproducibility through the objective and transparent processing of the literature (Moher et al., 2009, Tricco et al., 2018). The process used in this research is summarized in Figure 1.

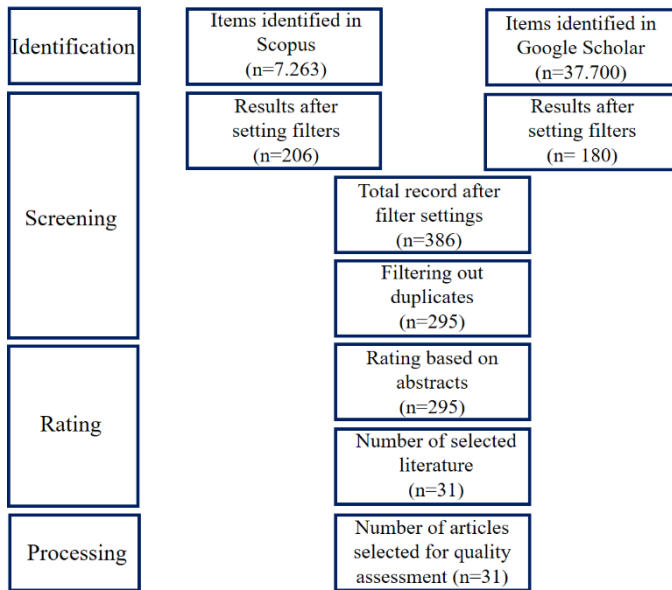


Figure 1: Flowchart of systematic literature review

Source: Own editing based on Moher et al. (2009), 2025

The literature search was conducted in June 2025 in the Scopus and Google Scholar databases. The search terms ‘work addiction’ and “workaholism” were used, along with the ‘OR’ operator. Based on the results obtained, we identified more than 44,000 results. We then implemented filters to narrow the search down to the field of management, searching in the title and abstract. This reduced the number of results to 206 in Scopus and 180 in Google Scholar. After filtering out 91 duplicates from the two databases, the number of journals articles whose abstracts were read fell to 295. We introduced a new criterion at this point in the PRISMA protocol, according to which we retained studies that also dealt with personality. As a result of the qualification, we were able to select 31 journal articles for quality assessment.

4. Results

In the following, we would like to provide a summary of the manifestations of work addiction and personality within organizational frameworks based on the 31 studies selected for quality assessment. It can be concluded (Figure 2) that the number of studies discussing work addiction in the field of management – which also take into account some aspect of personality – has been increasing over the years. Although work addiction has been identified for more than half a century, the first study on personality in the field of management was published in 2001, according to the

Scopus and Google Scholar databases. Interest in the topic has since grown, with the highest number of such studies, five, identified in 2024.

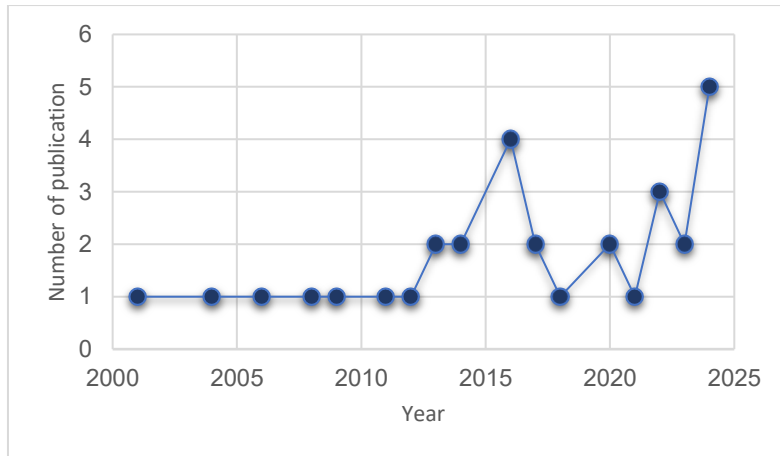


Figure 2: Research developments in work addiction within organizational frameworks in relation to personality
Source: Own editing, 2025

Figure 3 shows sample data from publications selected for quality assessment, with particular regard to the number of items and nationality. The number of items in studies dealing with the same nationalities have been combined. The research collaborated with a total of 14,086 people, and it can be seen that many nationalities are involved in this topic. In terms of the number of participants, the largest proportion of research was conducted in the Netherlands, but similar research is also being conducted in Asia and America beyond Europe.

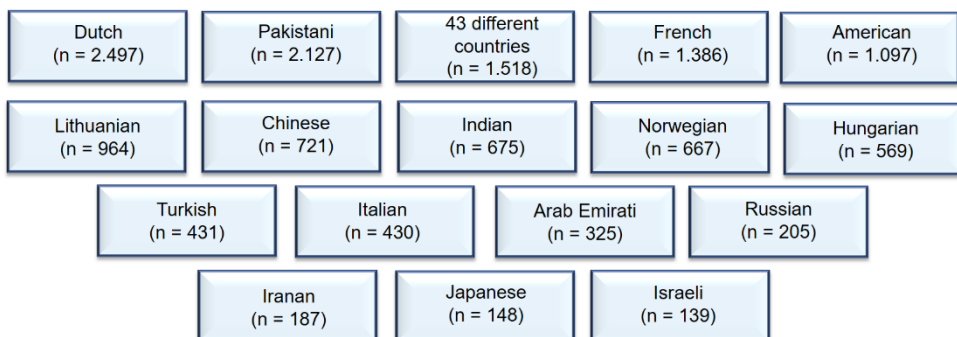


Figure 3: Number and nationality of research participants
Source: Own editing, 2025

The studies selected for this paper provide a comprehensive picture of how work addiction develops, what individual and organizational factors reinforce it, and what consequences it has in the workplace. We considered it worthwhile to group the selected articles into the following three dimensions: personality and individual disposition, organizational and environmental conditions, and the consequences of workaholism for the individual and the organization as a whole. Most of the publications address extensively with the phenomenon of personality and workaholism within organizational frameworks, so a single study may belong to more than one dimension. In the following, we present the main findings of the studies along these three dimensions.

4.1. Personality traits and the dimension of work addiction

The selected studies analyze a number of personality traits that may be relevant factors in relation to work addiction. These are illustrated in Figure 4, where the frequency of occurrence is also reflected in the font size.



Figure 4: The role of personality traits in work addiction
Source: Own editing, 2025

Perfectionism is a key factor in workaholism (Morkevičiūtė, Endriulaitienė, 2022). It can even be suggested that strong perfectionist traits serve as a driving force for workaholism, as maladaptive perfectionism is one of the strongest predictors of workaholism (Falco et al., 2020, Tziner, Tanami, 2013, Fayyazi et al., 2013).

Maladaptive perfectionism is a form of perfectionism that does not serve to improve performance but rather impairs effective functioning and can lead to harmful consequences. This can happen, among other things, because the individual establishes excessively high, often unrealistic expectations for themselves that are never met, thus creating constant dissatisfaction. All this can be accompanied by an extreme fear of failure, which can lead to chronic anxiety. If the end result is not perfect, it is in conjunction with a decrease in self-esteem. Chronic procrastination or compulsive overwork are also manifestations of maladaptive perfectionism, as

such individuals obsessively improve their work due to their feeling of 'not being good enough' and never feel that it is finished. Perfectionism in itself would not be a problem, as there is also such a thing as healthy perfectionism, which is characterized by high but realistic expectations, thereby motivating the individual and helping them to achieve their goals, thus ending the process with a feeling of satisfaction (Falco et al., 2020, Bovornusvakool et al., 2012).

Behind maladaptive perfectionism may be driven by an external locus of control attitude, i.e. the belief that the main factors in an individual's life are controlled by external elements, not by themselves. Those with an external locus of control are more likely to work overtime compulsively because they feel that they can only 'keep things under control' if they work continuously (Gillet et al., 2017). Other studies have also confirmed the link between external control and work addiction (Gholipour, Nargesian & Tahmasbi, 2008).

Narcissism and narcissistic traits are personality characteristics that are increasingly associated with work addiction. Narcissistic traits and work addiction are often related, especially among entrepreneurs and managers. These personality traits can initially drive entrepreneurial innovation, which is the key to success, but only in the short term. Narcissistic traits lead to a strong entrepreneurial spirit and a tendency to overwork. (Shirokova et al., 2024, Veksler et al., 2024). However, this behaviour is not sustainable in the long term, and adequate family or organizational support is necessary to avoid harmful consequences (Gubik, Vörös, 2023).

As mentioned earlier, there are numerous theories on the study of personality traits, but the Big Five dimensions – extroversion/introversion, openness, neuroticism, agreeableness, and conscientiousness – are often associated with work addiction, and important results have been found. Researchers have found a strong positive correlation between neuroticism and work addiction (Clark et al., 2016, Schaufeli, 2016), which may be in some part attributed to the fact that more anxious people use work to reduce negative feelings. Paradoxically, conscientiousness, openness and extroversion are all associated with work addiction. Both low and high levels of conscientiousness can lead to hard work and thus activate a tendency towards work addiction (Hung, 2020).

In the former case, this is induced to excessive compulsive work (since people with weak conscience are less capable of self-discipline, planning and organization, they are forced to compensate for this with excessive work), and in the latter case, it is caused by an increased need to prove oneself (Therthani et al., 2022). Furthermore, high extroversion and openness can increase the risk of work addiction through the desire for social recognition. A high level of agreeableness may be the only protective factor against work addiction through a tendency to cooperate. Conversely, those who are less friendly and, for example, more disposed to competing with others, are more likely to become workaholics (Babalhavaej, Taghvaei & Soleimani, 2016, Fayyazi et al., 2013, Mazzetti, Schaufeli & Guglielmi, 2014).

The pursuit of dominance (e.g., acquiring a leadership role or controlling others) can also be linked to work addiction, as dominant individuals are more likely to take on too many tasks in order to strengthen their positions of power (Veksler et al., 2024). Other studies suggest that work addiction is more prevalent among Type A personalities (who are most characterized by competitive, impatient and hostile

traits) because they are unable to relax or quit as a result of the constant pressure to perform and compete (Burke, Ronald J., Richardsen & Martinussen, 2004). Self-esteem and self-evaluation – especially when weak – can be linked to a tendency towards work addiction. This is because these individuals try to compensate for their inner insecurity with success at work (Gillet et al., 2017, An et al., 2021, Zahid, Fiaz & Taus, 2024). Workaholics often have an ambivalent mindset ('I'm either perfect or a failure'), an excessive need for self-control, and the belief that work is the main source of self-esteem (Van Wijhe, Peeters & Schaufeli, 2014). These cognitive patterns are often reinforced by early attachment problems (e.g., anxious or avoidant attachment styles), which are compensated for in adulthood through work, and these individuals may even take on excessive amounts of work with the intention of strengthening their social connections (Tziner, Tanami, 2013). This intention can even manifest itself in altruism, i.e. a behaviour pattern in which helping others is prioritized over oneself. Remarkably, this noble act also poses a risk in terms of work addiction: excessive commitment to supporting colleagues or clients can easily lead to overload and neglect of one's own needs (Ali Nisar et al., 2024).

An individual's time interpretation is particularly important in the manifestation of work addiction, which is also reflected in the time management of those affected. According to some analyses, a future-oriented time perspective (when someone constantly focuses on future goals) can predispose them to workaholism because it increases action without procrastination and the constant pursuit of performance. (Eslami, Kanai & Matsumoto, 2022). Workaholics are often future-oriented, and because of their concerns about the future – which in many cases are mediated by perfectionism – they are unable to live in the present, thus missing out on opportunities for regeneration.

On the other hand, flexible thinking, self-confidence and optimism appear to be protective factors against work addiction. In other words, the ability to adapt to changing circumstances and set realistic goals (Sharma, Sharma, 2011), to which the individual adheres faithfully, consistently representing their inner values (Vitiello, Aziz & Wuensch, 2016). This state of high self-efficacy – i.e. an individual's belief in their ability to achieve their own goals – can be protective against work addiction, as it reduces the compulsion to work excessively, but only when combined with high self-esteem and low dependence on work (Razzaghian, Shah, 2018).

4.2. Dimension of organizational circumstances

There is no doubt that personality traits play a significant role in workaholism, but there are organizational circumstances which, when experienced over a long period of time, can push individuals towards workaholism as a form of deviant behaviour. From this perspective, the proportion and distribution of workload is a particularly important aspect of working conditions. If the workload in an organization is excessive and persistent, or if organizational expectations are characterized by unrealistically high work demands and high pressure on employees, this can increase the frequency of workaholic behaviour (Falco et al., 2020, An et al., 2021, Schaufeli, 2016).

Accountability – i.e. when employees take responsibility for their own work and are required to report on their results in line with managerial or organizational expectations – plays a dual role in the development of work addiction. A moderate level of accountability can motivate effective work, help achieve goals, and increase a sense of responsibility. However, if accountability is excessive or continuous and coupled with strong external pressure, it can increase the tendency towards workaholism, especially among those with a high sense of conscience or perfectionism (Babalhavaei, Taghvaei & Soleimani, 2016).

Employees' sense of security also plays a significant role in work addiction. Psychosocial safety at work, i.e. how employees feel about their workplace from a psychological and social point of view — in other words, how safe they consider it to be, where they are not threatened, abused or exposed to excessive stress — has a significant impact on the development of work addiction. Psychosocial safety at work was interpreted by employees as a combination of factors such as workplace support, workplace stress levels and workplace conflicts. The results of the study showed that higher levels of psychosocial safety at work reduced the likelihood of developing work addiction (Gillet et al., 2017).

Feedback is also important within the organization, especially for employees with an external locus of control, who are more likely to become workaholics if they work in an organizational environment where feedback is rare or inconsistent (Razzaghian, Shah, 2018). People with external control tend to try to compensate for their lack of control over their own destiny by working compulsively, which is why external feedback is crucial for them (Gillet et al., 2017, Razzaghian, Shah, 2018).

Salary was also linked to work addiction, and an inverse relationship was found between the two phenomena: it was determined that individuals with low salaries tend to have higher work addiction, perhaps out of fear of losing their jobs (Sharma, Sharma, 2011). This is mainly due to existential fear, the need to prove oneself, and a lack of organizational support – these factors make people prone to working compulsively, as if they wanted to 'buy' job security with their overtime (Clark et al., 2016).

Remote working and flexible working arrangements are now considered completely normal in today's working environment, but they can easily lead to work addiction. This is because they blur the boundaries between work and private life, and the expectation of availability can become constant, leading to frequent voluntary overtime. It is very important to establish clear rules regarding availability expectations, to provide managerial support for not working, and to provide technological tools. If there is no clear communication about these working conditions, work addiction will increase rather than healthy productivity (Mcilveene, Davis & O'Sullivan, 2024).

It is also worth paying close attention to the emergence of work addiction within organizational frameworks for preventive purposes, because according to social learning theory, organizational actors can pass on this deviant behaviour to each other through role modelling, like a social contagion (Razzaghian, Shah, 2018).

4.3. Organizational consequences dimension

Work addiction is as much an organizational problem as it is an individual one, as its manifestation within an organization can trigger a number of undesirable consequences. Workaholism – which is not just about working long hours, but also involves compulsive behaviour – is harmful to employees' mental and physical health in the long term, as well as to their relationships at work and in their private lives (Clark et al., 2016). Workaholism has a negative impact on individual mental well-being (Burke, Ronald, Koyuncu & Fiksenbaum, 2009) and often causes health problems on both a psychological level (e.g. anxiety, depression, etc.) and a physical level (e.g. sleep disorders, cardiovascular problems, etc.) (Therthani et al., 2022). It also has a detrimental effect on social life, as workaholism negatively affects family and friend relationships due to a lack of balance (Clark et al., 2016). At the organizational level, there is no advantage to workaholism, as it does not necessarily lead to better work performance. Although workaholics may appear to perform well in the short term, in the long term, excessive work can actually reduce productivity due to stress and burnout (Hung, 2020, Clark et al., 2016). In addition, the stressful environment generated by workaholic employees also affects their colleagues, who often feel pressured to work harder in order to meet expectations or keep up. The 'workplace norms' created by workaholic behaviour can create an atmosphere that reinforces a work-centric culture, thereby increasing tension and undermining workplace well-being (Porter, 2001). In advanced cases, counterproductive behaviour – i.e. any intentional behaviour that is contrary to the organization's goals and that impairs workplace efficiency, the organizational atmosphere or the well-being of colleagues – is considered one of the consequences of workaholism. This also has a long-term negative impact on employee well-being and leads to burnout (Razzaghian, Shah, 2018, Sharma, Singh & Sharma, 2017).

Given that workaholic behaviour patterns are not necessarily always accompanied by negative feelings about work, it is conceivable that workaholics experience a sense of flow when immersed in their work, especially if they have a positive attitude towards their activities. However, this state only provides temporary protection from harmful consequences, and in the long term, they are also at risk of burnout (Rouxel et al., 2023).

Overall, organizational culture and management style also have a significant impact on the development and persistence of workaholism: if the workplace environment conveys excessive performance expectations and does not place sufficient emphasis on recreational activities, this reinforces workaholic behaviour within the organization. Workplaces where there is no support, or where managers also exhibit workaholic patterns, produce higher rates of workaholism among those affected (Burke, Ronald J., Berge Matthiesen & Pallesen, 2006).

5. Conclusions

Work addiction is becoming an increasingly serious problem in the workplace, damaging not only individual health but also team and organizational performance.

Research shows that this is not primarily influenced by salary or financial rewards, but rather by how much control people feel they have and what their working environment is like. Working from home and flexible working have many advantages, but without clear rules and boundaries, they can easily lead to overwork and exhaustion. This overwork often becomes counterproductive: efficiency decreases, stress increases, and working relationships deteriorate. It is therefore important for managers to pay attention to how they support their employees in finding a balance between work and private life and to help them not only survive but also feel good about their work. It is worth ensuring that employees with different personality traits have the opportunity to use different strategies in their work, even if the work process is similar.

Some solve the same task through creativity, others through a more thorough analysis of the situation (Hung, 2020). In the future, it will be worthwhile to examine work addiction not only among those already in employment, but also among those who are over the age of 18, continuing their studies, but not yet in employment. Our research results confirmed that, as stated in the literature (Gillet et al., 2017), work addiction is not only contextual but also has a significant personality-determined aspect. As a result, work addiction may already be reflected in the attitude towards studies, the motivation behind them, and especially in the importance of performance and control (Hajdu, Barizsné & Kotsis, 2022), which may be important when they later enter the labour market, both for the host organization and human resources professionals, as well as for those involved and their future managers. In today's world of intense digitalization and technological development, work addiction should also be included among the challenges facing leaders (Török-Kmoskó, Dajnoki, 2024, Sivilca et al., 2024). If you can prevent even one instance of deviant behaviour in your organization, you will have already done a lot to achieve your organizational goals efficiently and effectively while retaining valuable employees.

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CORRELATING HCOP PROJECT FINANCING WITH THE NEED FOR WORKFORCE QUALIFICATION IN ROMANIA

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Abstract:

After Romania's integration in the EU, many of the funds directed by the European Commission towards our country were meant to reduce the social and economic disparities between Romania and the developed western countries. The Human Capital Operational Program (HCOP) establishes the investment priorities, specific objectives and actions undertaken by Romania in the field of human resources, thus continuing the investments made through the European Social Fund in the period 2007-2013 and contributing, at the same time, to reduce the disparities in economic and social development between Romania and the EU Member States. This paper is a part of a PhD theoretical research aimed at determining the impact of the distribution of HCOP funds had in the development of workforce qualification in various regions of Romania. It makes correlations between the need for skilled workers in different economic fields, as stated in regional development plans, the actual distribution of HCOP funds via local and regional projects and the actual results the implementation of these projects had. The eight development regions of Romania, as created in 1998, had and have different needs for learning, social and economic development. This research studies the way the financing of the projects addressed these needs and the degree to which the implementation of the afore mentioned projects positively impacted the development of each region. It will show how the more funds are transferred to a region, the more its social and economic disparities are reduced, if these funds are directed towards the real needs of that region. It also presents how implementing projects aimed at qualifying and mobilizing workforce will reduce the unemployment rate, will increase the wages and it will also increase school participation. Basically, the research shows the direct relation between funding projects aimed at human resource development and the actual development of the region in which the funds are invested.

Keywords: *HCOP; workforce; projects; regional development; qualification*

JEL Classification: *D61; D69; H43; I24; I25; I30*

1.General considerations on HCOP implementation in Romania

Romania is facing a significant shortage of highly qualified workers. By 2030, it is estimated that over 600,000 people will be needed to fill highly qualified positions, while specialized universities annually train around 40,000 graduates. This imbalance between supply and demand can affect the economic competitiveness of less developed regions. To address these challenges, it is essential to implement

regional policies that support continuous professional training, stimulate investment in education and create favorable conditions for attracting and retaining talent in areas with low potential.

The Human Capital Operational Programme (HCOP) aimed to mobilize around €5 billion (of which €4.3 billion came from the EU budget) to support Romanians, including young people, in finding a job, increasing their level of education and skills, reducing poverty and social exclusion, and supporting social services and labour market institutions. Particular attention was paid to young people, Roma and rural populations.

The programme has had seven priorities with the following EU allocations:

- “Priorities 1 and 2 were dedicated to the implementation of the Youth Guarantee in Romania, with €211 million for Youth Employment Initiative eligible regions (Centre, South East and South Muntenian) and €362 million for the rest of the country. The measures were to be tailored to the profiles of young people not in employment, education, or training (NEETs). These could include counselling, orientation, training, help to set up companies and support for mobility, as well as incentives for employers to create jobs, apprenticeships programmes” (<https://smartintegration.ro/en/news/ce-adoptat-astazi-programele-operationale-capacitate-administrativa-si-capital-uman/>)
- Priority 3, “Jobs for all”, has had an EU allocation of €1.1 billion. It would support access to employment, with a focus on unemployed and inactive people, long term unemployed, older workers, disabled and persons with lower level of education. This will entail improving their skills, facilitating the recognition of their qualifications or work experience; supporting labour mobility between different regions of Romania and assisting the participants in finding a job or setting up micro companies and SMEs, among others (European Commission, 2023).
- “Priority 4, with €940 million, aimed to promote social inclusion and to fight poverty. Integrated measures would help disadvantaged people, including Roma, to access the labour market, by improving their skills and supporting entrepreneurship and social enterprises, among other actions. Several vulnerable groups would be supported, such as homeless, persons suffering from dependence, victims of domestic violence or trafficking, prisoners or ex-offenders, elderly and disabled people. Specific support would also be provided to social services, such as social assistance, health and care services”, including support the so-called “de-institutionalization” (<https://smartintegration.ro/en/news/ce-adoptat-astazi-programele-operationale-capacitate-administrativa-si-capital-uman/>).
- Priority 5, with €201 million, supported local development under the responsibilities of the communities. It covered urban areas (cities of over 20 000 inhabitants), with a focus on disadvantaged communities. Thus, it would complement the support for rural areas and smaller cities under the Rural Development Programme.
- Priority 6, Education and skills, would invest €1.2 billion to support second chance education for young NEETs, reduce early school leaving, improve access and quality of tertiary education, support apprenticeships,

traineeships and lifelong learning, improve teachers' skills, support entrepreneurship education, as well as vocational education and training in general, always aiming at increasing their relevance to the demands of the labour market. Particular attention was given to disadvantaged people, such as Roma or persons from rural areas or with low skills, for instance through scholarships.

- Priority 7 included the remaining €258 million for technical assistance to implement the programme (www.smartintegration.ro, 2015).

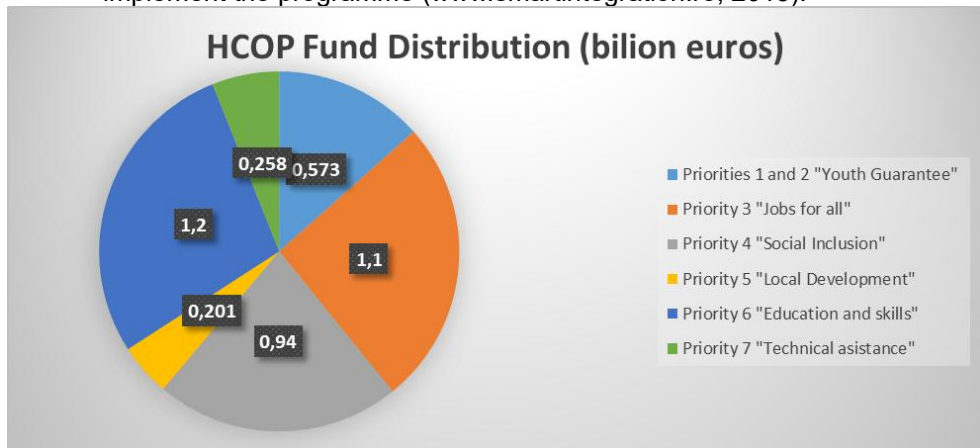


Figure 1 – The prioritized distribution of HCOP Funds in Romania

2. The main challenges addressed by the implementation of HCOP Funds

The main challenges addressed by the implementation of HCOP funds in Romania are: low employment rate, the continuous decrease of qualified (skilled) workforce and the high early school-leaving rate. The alteration of these indicators has a high impact on social inclusion and economic welfare. The need to face these impediments can be seen from the distribution of the majority of funds towards priorities 3 and 6 (jobs, education and skills).

The distribution of skilled labour in Romania's regions is influenced by factors such as the level of economic development, educational infrastructure, and dominant sector of activity. In general, regions with more developed economies and a greater concentration of activities in areas such as IT, financial services, and advanced industry tend to have a higher share of highly skilled employees. (Romanian Government, 2021)

In the year 2015, at the beginning of the implementation of the HCOP funds, the situation was displayed as follows: in the *Bucharest-Ilfov* region, the concentration of highly skilled workforce was of 81,4% out of the total employed workforce, the *Centre* and *West* regions had a concentration of 64,3% and 60,5 %, in the *North-West* region 62,2% of the total workforce was highly skilled, while in *South-West-Oltenia*, 63,3% of the total workforce was highly qualified. *South-Muntenian's* workforce was 57,8 % highly qualified, whereas the *South-East Region* had 54,2% of its workforce following the same pattern. The least qualified workforce belonged

to the *North-East* region, where most of the job were in agriculture and public service, amounting to 45,1% highly skilled workforce. The displayed numbers refer to the workforce which had graduated at least high-school (12 years of formal education) (www.infrared.ro, 2016).

Another important factor that determined the distribution of highly skilled workforce in Romania was the polarization between the urban and rural area. The highly urbanized regions, such as Bucharest-Ilfov, Centre and West ranked highest in the percentage of highly skilled workforce, while the mostly rural regions like North-East and South-East, ranked lowest.



Figure 2 – The percentage of highly skilled workforce in the total employed regional workforce, in 2015

3. Tackling the most urgent issues

The most pressing issues that prevented Romania from reaching the economic and social status of the better developed countries in the EU were considered to be the high rate of unemployment amongst the young people and persons over 54 years old, who found it difficult to get a job once some of the industries lost their representation in the Romanian economy. Developing new skills was considered to be crucial, both for young persons who were about to enter the employed workforce, as for the older persons who possessed skills that no longer suited the structure of the Romanian economy (such as miners, workers in the extraction industry, workers in the heavy machinery industry etc.)

The need to urgently address these two problems can be seen from the distribution of the HCOP funds, according to the prioritization, as Priority 3 – “Jobs for all” and Priority 6 – “Education and Skills” received the largest amount of financing (1.1 and 1.2 billion euros) (Ministry of Investments and European Projects, 2019).

The actual implementation of the afore mentioned two priorities stands as such: Corresponding to Priority 3 – “Jobs for all”, 651 projects out of a total of 2944 (approximately 22%) were implemented or being implemented at the 31st of January 2023. The total amount distributed across these projects was approximately 7.044 billion LEI, amounting for an average of 10820074,42 LEI per/contract. Out of these

contracts, 12 of them amounting for 42419415,72 LEI were terminated before implementation, leaving a total of 639 contracts implemented or in implementation, amounting for 7001449029,86 LEI at an average rate of 10956884,24 LEI / contract. Corresponding to Priority 6 – “Education and skills”, 1013 projects out of a total of 2944 (approximately 34%) were implemented or being implemented at the 31st of January 2023. The total amount distributed across these projects was approximately 5.53 billion LEI, amounting for an average of 5454055,75 LEI per/contract. Out of these contracts, 17 of them amounting for 69916000,66 LEI were terminated before implementation, leaving a total of 996 contracts implemented or in implementation, amounting for 5455042475,06 LEI at an average rate of 5476950,276 LEI / contract (Ministry of Investments and European Projects, 2023).

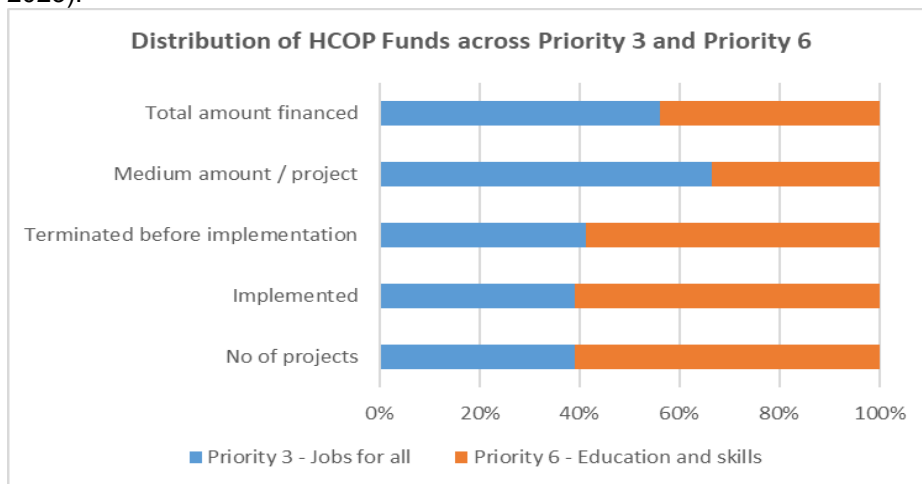


Figure 3 – The distribution of HCOP Funds across Priority 3 and Priority 6

As it stands out, the projects aimed at creating jobs and improving skills for people already trained (Priority 3) had a double value per/project than those targeted at NEETs (young people between 16 and 24 years old, not employed or in education or training), financed for Priority 6. We cannot make considerations on the distribution of funds across the eight Romanian regions, as most of the projects were transregionally implemented.

4. Implementation results

In the authors' point of view, the most important results of the implementation of the HCOP projects to be taken into consideration are those related to the creation of jobs for disadvantaged labourers (Priority 3) and to giving a second choice at education and training to young people not employed or in education or training NEETs (Priority 6). We shall take into account the 8-year span between the beginning and the end of the Human Capital Operational Programme, from 2015 to 2023.

Regarding the opportunity to provide good skilled jobs for every labourer, be it through increasing their skills, acquiring new ones or providing new job opportunities for disadvantaged workforce, the 2023 situation (according to the National Institute of Statistics) is as follows:

In what regards the regional considerations, we can state that in the *Bucharest-Ilfov* region there is a significant concentration of highly qualified employees (87 % of the total employed workforce), due to the presence of top educational institutions, multinational companies and a well-developed IT sector, in the *Centre* and *West* regions there is balanced economic development, with diversified industrial and service sectors, which contributes to a higher share of qualified employees (74 % of the total employed workforce), the *North-West* region has a significant share of highly qualified employees, supported by important university centers and investments in areas such as IT and industry (66,3% of the total employed workforce), the *North-East* and *South-Muntenian* regions face challenges in terms of forced migration and dependence on traditional sectors, which can negatively influence the share of qualified employees (52,25% of the total employed workforce) and, finally, the *South-West Oltenia* and *South-East* regions also display low shares of highly qualified employees, reflecting a higher concentration of activities in agriculture and low value-added sectors (55,45 % of the total employed workforce) (Romanian National institute of statistics, 2023).

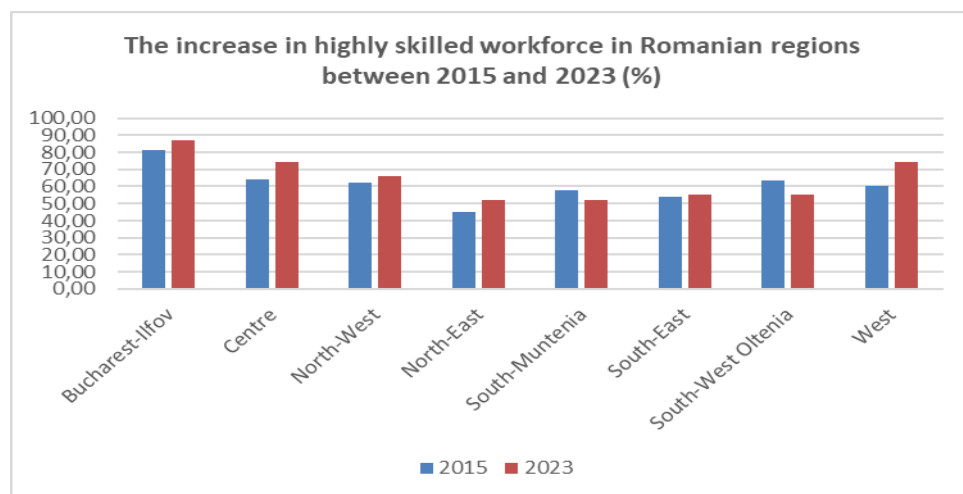


Figure 4 – The increase in highly skilled workforce in Romanian regions (% of the total workforce) at the end of the HCOP programme

In what regards the projects aimed at giving a second choice at education and training to young people not employed or in education or training NEETs (Priority 6), we have the following situation, at the beginning and at the end of the programme: In 2013, the school dropout rate in Romania was 17.3%, according to Eurostat data. This represented the percentage of young people aged 18 to 24 who had completed

no more than the eighth grade and had not followed any form of education or vocational training (Eurostat, 2013).

The distribution of this phenomenon by region was as follows: North-East: 23.6%, South-East: 22.4%, Centre: 21.1%, South-Muntenian: 18.8%, South-West Oltenia: 17.6%, North-West: 16.3%, West: 11.3%, Bucharest-Ilfov: 5.5%.

In 2023, at the end of the programme, the school dropout rate in Romania was 16.6%, significantly above the European Union average of 9.5% and above the EU target of below 9% for 2030. Available data indicate significant variations in the school dropout rate between the regions of Romania: Bucharest-Ilfov: approximately 7.9%, West: approximately 11.4%, North-West: approximately 11%, South-Muntenian: approximately 13%, South-West Oltenia: approximately 14%, South-East: approximately 23%, Center: approximately 23%, North-East: approximately 29.5% (www.monitorsocial, 2023).

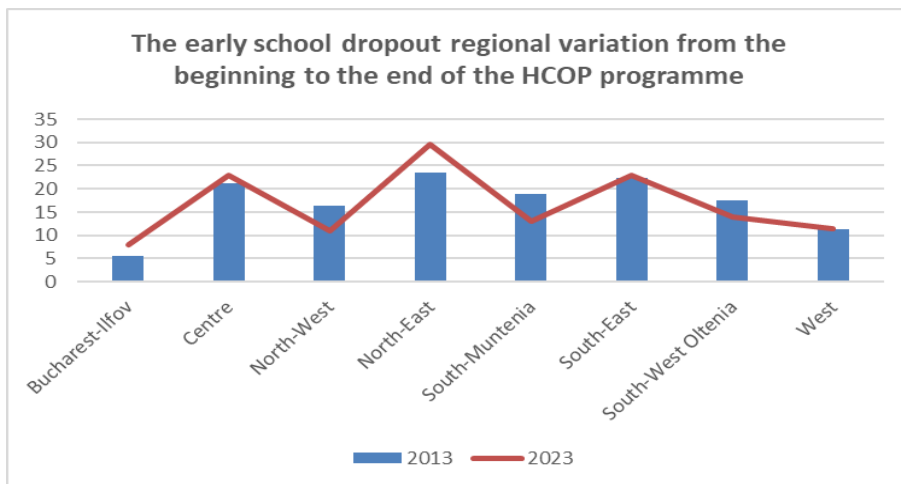


Figure 5 – The early school dropout regional variation from the beginning to the end of the HCOP programme

Taking into comparison the results of provided by the National Institute of Statistics for the 2013 and 2023 years, we can determine that there wasn't a great decrease in the early school dropout rate at the end of the programme implementation, it being only of about 0,7 percentage points. The regions with the largest decrease were North-West, South-Muntenian and South-West Oltenia. There was, however, a massive surge in early school dropout in the region of North-East, of approximately 6 percentage points, reaching almost 29.5 %.

5. Conclusions

The Human Capital Operational Programme was meant to reduce disparities both between Romania and the developed western EU countries as to reduce disparities between the eight regions of Romania, in terms of education, highly skilled workforce, employment and access to social utilities, as well as to increase the socio-economic status of the vulnerable population.

In what regards the priorities, out of the seven taken into consideration, the largest amount of financing was attributed to priorities 3 – Jobs for all and priority 6 – Education and skills, 2.3 billion euros out of a total of approximately 5 billion were directed towards the aforementioned priorities.

The results of financing Priority 3 are quite visible in all the development regions of Romania. At the end of the programme implementation the percentage of the highly skilled workforce in Romania raised with approximately 4.5 point, from 61.1% to 64.59 %. However, there are regions which highly benefitted from the programme financing, such as West, North-East and Centre (which raised their percentage of highly skilled workforce with 13.5, 7.5 and 9.70 points, respectively) and there are regions in which the implementation of the programme was not very successful, dropping losing part of their qualified workforce, such as South-Muntenian and South-West Oltenia, regions that dropped 5.55 and 7.85 points in the percentage of qualified workforce.

This can be traced to two major reasons. The first reason is that the great majority of the 639 financed contracts were transregional, but most of the beneficiary NGOs were based in either Bucharest-Ilfov, West or Centre. Thus, the target groups of the projects were mainly set in those areas, providing most of their support to the workforce there. The second reason is the migration of the workforce. Most of the investments in new factories or facilities which required highly skilled workforce were made in the previously mentioned three regions and thus, the highly skilled workforce that might have been trained in the regions which dropped their percentage (such as South-Muntenian and South-West Oltenia) found jobs mostly in the West and Bucharest-Ilfov area.

Regarding the results of financing Priority 6 – Education and skills, those could be found as little in correspondence to the large amount of money invested. Although almost 1.2 billion euros were invested in 996 financed contracts, the percentage of early school dropout was reduced by only 0.7 points in 10 years, still remaining at about double the medium of the European Union (16.6% in Romania, 9.5% the medium of the European Union).

The reasons can be different. One is that most of the projects implemented via Priority 6 received half of financing of that of those implemented via Priority 3 – the medium contract for a Priority 3 project is almost 2.1 million euros, while the medium contract for a Priority 6 project is approximately 1.1 million euros. Having a larger number of approved projects for approximately the same amount of money (639 financed projects for Priority 3 as opposed to 996 financed projects for priority 6) turned out to actually reduce the results.

Early school dropout is commonly known as termination of the formal education prior to the completion of mandatory schooling, i.e trade school or high-school, in the case of Romania. Many of the projects financed via Priority 6 targeted groups with very low level of schooling (none whatsoever or primary school, at the most). Although the results were visible and high, they could not be taken into account, as those groups, even at the termination of the projects and after transitioning from no schooling to primary schooling could still be marked as early school dropouts. Not only that, but as the projects were extended over a period of 3 years and as the common period to finalize mandatory schooling in Romania is 4 years, at the end of

the project, the persons in the target groups still remained to graduate either trade school or high school.

The last and most important reason is that some of the objectives from the two mentioned priorities were quite opposite. Rapidly qualifying workforce and inserting it in the labour market via priority 3 prevented target groups from the projects accessed via priority 6 to continue their schooling, as most of the persons targeted were low-income and in dire need to get employed and have a steady income. Thus, being made to choose between a rapid insertion into the labour market or finishing mandatory schooling, many of the social and economic disadvantaged persons chose the former.

To sum up, the implementation of the Human Capital Operational Programme was a success in terms of having a higher skilled workforce and a higher rate of employment. It remains that the state continues the measures taken in what regards giving a second choice at education and qualification for early school drop outs. This should be done via public policies, as it could be seen that in this respect macro projects had higher impact than regional micro managing the problem.

Acknowledgments

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STRATEGIC MANAGEMENT OF LEADERSHIP SUCCESSION AND RELEVANT ECONOMIC ACTORS

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Abstract: *Leadership succession is a process of strategic importance in the life of every organization, as the successful transfer of management and ownership rights has a fundamental impact on long-term competitiveness, sustainability, and value creation. Succession is not a one-time event, but a complex, multi-step process shaped by organizational, human, and environmental factors. The aim of this study is to present the theoretical and practical aspects of succession, with particular emphasis on the gradual transfer of management functions and the economic challenges that arise from this. The literature distinguishes between two basic approaches: gradual models, which emphasize the step-by-step nature of succession, and life cycle theories, which link leadership change to the phases of organizational development. Handler's "legacy dance" model describes in detail the process of role transformation between predecessor and successor. In the initial phase, the predecessor plays a dominant role, while the successor gradually increases their decision-making competence and eventually becomes a full-fledged leader. The predecessor retreats into an advisory role, facilitating the gradual transfer of knowledge and maintaining organizational stability. The success of succession is influenced by the motivation of both parties, generational differences, and differences in leadership styles and values. The personality, age, and decision-making willingness of the founder are decisive factors, while the preparedness, motivation, and leadership competencies of the successor are key. In family businesses, succession is a particularly sensitive process due to the intertwining of ownership and management functions, but the issue is also relevant in the case of non-profit and community organizations, such as associations, where a change in leadership affects institutional legitimacy and the maintenance of trust. The literature distinguishes between three main models: the rational model, which emphasizes efficiency; the vicious circle model, which attributes succession failures to organizational disruptions; and the ritual scapegoating model, which interprets leadership change as a symbolic response to crisis. According to the integrative approach of the latest research, the success of succession is influenced not only by individual and organizational factors, but also by the industry and macroeconomic environment. Overall, succession is a strategic process based on trust, gradual transfer of responsibility, and intergenerational cooperation, which is one of the keys to the long-term economic survival of organizations.*

Keywords: *leadership; succession; participants; process*

JEL Classification: Z13 (*other special topics, Economic Sociology; Economic Anthropology; Language; Social and Economic Stratification*)

1. Introduction

The issue of succession is of strategic importance in the life cycle of organizations, as the effectiveness of the transfer of management and ownership rights fundamentally determines the long-term competitiveness, sustainability, and growth potential of the company. Succession is not merely a legal or formal act, but a complex organizational and human process in which decision-making powers, areas of responsibility, and knowledge are gradually transferred from the predecessor to the successor. The success of the process is determined by factors such as the maturity of human resources, organizational culture, and trust and cooperation among stakeholders.

The literature agrees that succession cannot be considered a one-off event, but rather a gradual, multidimensional process that involves the transfer of experience, power, and decision-making competencies. During this process, the role of the predecessor gradually shifts from strategic management to an advisory function, while the successor's managerial autonomy and responsibility gradually increase.

The relevance of this topic is reinforced by the fact that a significant proportion of Hungarian businesses and civil society organizations—including associations working with the elderly—were founded in the 1990s, and their founders have now reached an age where planning for the transfer of leadership has become inevitable. As a result, succession management is not only a personal issue, but also a key element of organizational sustainability, which has a direct impact on economic stability and long-term operational efficiency.

The aim of this study is to present the theoretical and practical aspects of the succession process, with a particular focus on analyzing relevant models, research directions, and the economic and organizational characteristics of leadership transfer.

2. The process of succession

According to this definition, researchers agree that succession should be understood as a process rather than a single event (Churchill and Hatten, 1987). Succession is not a sudden transfer of control or ownership, but a gradual process that begins with the participation of successors in certain areas of the organization. The succession process can be understood using two main theoretical approaches:

- the stage model and continuity (Longenecker and Schoen, 1978), and
- the life cycle model (Greiner, 1998).

Gradual-sustainable models treat transfer as a repetitive and periodic process, while life cycle models attempt to describe the development of the organization and the "life path" leading to transfer based on various factors. Handler's (1989) model includes the process of transfer through leadership roles, which is consistent with

the main objective of my dissertation, namely the study of leadership roles. In addition, this model is very suitable for small organizations where leadership roles are clearly separated, making the process of leadership transfer easier to identify and measure.

One of the best-known models of continuous transfer is the model called the "succession dance" by Handler (1989). This model divides the transfer process into stages that cover both the period before and after the arrival of the successor (Handler, 1989). The model was developed by Handler (1990) based on interviews with 32 family businesses, in which members of the next generation of the family indicated that their roles had been shaped by their predecessors. Based on his findings, he describes a process based on a mutual role change, in which roles do not appear separately, but develop gradually during the transition. In this case, the successor does not play any role at the beginning, but first appears as an assistant, then as a manager, and finally as a leader. At the same time, the transferor initially acts as the sole executor, then takes on a dominant role, and finally participates in the process as a transferor and advisor.

The decline in the role of the owners can be interpreted as a process in which participation and capabilities within the organization gradually decline in response to individual factors (e.g., health, age, new interests), organizational factors (growth, need for change, technological development), and environmental factors (disruptions, uncertainty) (Pfeffer and Salancik, 2003). As I mentioned earlier, Handler calls this process of mutual role reversal the "succession dance" and describes it as a slow but thorough process. At the heart of this process is the gradual transfer of leadership experience, authority, decision-making power, and shares.

Based on Handler's (1990) research, we can distinguish four roles in the continuity process (four "transferors" and four "transferees"). In the first stage, the only leader is the predecessor, who is primarily concerned with establishing and initially managing the business. At this stage, the owner is effectively the sole leader. The role of the successor does not yet exist at this stage. This may be because the successor has not yet been born, the need for succession has not yet been realized, or changes in personality, organization, or environment have not yet resulted in sufficient pressure. Handler (1989) emphasizes that the age of the successor generation influences when the successor recognizes their role. At this stage, the company is characterized by centralized management and a patriarchal organizational culture.

In the second stage, the dominant role is played by the predecessor, who has exceptional power over the organization and whose main goal is the survival of the company. At this stage, the successor joins the organization as an assistant, performs functional tasks, and learns the manufacturing processes.

In the third stage, the previous generation hands over their role to the successors, gradually transferring responsibility and control to them, and begins to withdraw from the company. At the same time, the successors take on leadership roles, assume management responsibilities, and begin to actively participate in the management of the company. This process is the most important stage, and according to Handler (1989), many companies fail to achieve it. The transition requires mutual trust, the ability to share and delegate tasks, and the predecessor's recognition that they must

hand over the reins. Until this recognition occurs, the predecessor and successor often have to work together for a long time.

In the final stage, the predecessor takes on an advisory role, no longer performing active management activities but remaining a member of the organization. The most important task in this stage is how the predecessor copes with the difficult departure from the organization and how the successor consolidates his or her leadership role and fully takes over power, influence, and job responsibilities. According to Handler (1990), succession can be considered complete when ownership is transferred along with managerial authority.

3.The players in succession

Lansberg (1983) describes the process of selecting a successor as an interaction between various stakeholders, including founders, family members, managers, business owners, and the external environment. Below, we analyze the motivations of founders and successors in more detail. This is important because it helps to better understand the role of each actor in the succession selection process.

The predecessor (in some cases, the founder)

During succession, the predecessor may serve as founder, owner, manager, or hold several functions at once, as noted by Lansberg (1983), who defines the predecessor as the person who influences the family, the company, and the wider environment. According to Nelson (2003), the founder is the person who creates or initiates the business and plays an important role in its development, taking on the most important management functions. In the "management" phase, the founder decides on the ownership structure, size, organizational structure, and other key factors, using their influence. Nelson (2003) emphasizes that although the position of CEO or president is defined by law and formal norms, the founder can be considered a social category whose role is understood through language. As He and Yu (2008) note, the ideas and interactive characteristics of founders are reflected in their extensive participation in the social capital of the company and their long service in the organization, and this close relationship has a significant impact on their motivation, decision-making, and organizational relationships.

According to Lansberg (1983), managers often decide to retire from the day-to-day management of the company, but in many cases they simply transfer their managerial powers and retain ownership until their death. There are several reasons for this. First, they do not want to relinquish complete control. If they retain part of the ownership, they can return at any time and intervene in the management of the company. Second, if they feel that the values or norms they have created are being violated, their ownership stake provides them with the basis for restoring their original position.

Hambrick and Crozier (1985) refer to this as the "critical point" or "founder's trap." This occurs when the founder's experience and abilities are no longer sufficient to manage the company effectively. In this case, management must be handed over to professional managers, otherwise the organization's operations may be jeopardized. Rubenson and Gupta (1997) refer to this phenomenon as "initial transfer."

After the founder's departure, a unique "psychological attachment" develops (Pierce et al., 2003), which can be explained by the concept of psychological ownership. Pierce and colleagues (2003:299) define this phenomenon as "the state in which an individual feels that a goal or part of a goal is his or hers." These psychological ownership rights often result in the founder remaining part of the organization's life mentally and, in many cases, behaviorally, even after formally handing over leadership.

In my opinion, age is a very important factor in the process of selecting a successor from the perspective of the predecessor's role. However, there is relatively little research specifically examining the relationship between the age of the predecessor and the process of selecting a successor. It seems logical that the older the owner of the company, the greater the chance that they will hand over the company. At the same time, the question arises as to whether this trend also applies to the transfer of certain elements of management.

According to the literature, the age of the owner-manager is an important factor in succession decisions, which affects not only individual behavior but also the functioning of the organization (Brickley, 2003). This relationship is confirmed by Hambrick and Mason's (1984) "top management" theory. Demographic characteristics influence managers' decisions and behavior, according to one theory. According to the conclusions of Hambrick and Mason (1984), age can have the following effects:

- Younger managers are more often associated with organizational growth.
- Older managers have less mental and physical flexibility and are less open to new ideas and behaviors.
- With advancing age, the ability to effectively integrate information may decline, which can delay the decision-making process.
- Older leaders may be more strongly committed to maintaining the status quo within the organization.
- Financial and professional stability may be more important to them.

One of the biggest challenges of succession is the generational gap, which is closely related to the establishment of businesses during the transition period in Hungary. At that time, young people in their thirties saw the establishment of a business as an opportunity to realize their dreams.

Today, most of them are active owners and managers over the age of 50 who are retiring. According to Csákné's (2012) study, the majority of Hungarian businesses are currently facing or will face succession problems in the near future. Thirty-two percent of respondents indicated that this problem does not affect them.

Most entrepreneurs facing succession problems belong to the "baby boom generation," i.e., the generation born in the 1950s, during the Ratkó era. Their age can have a significant impact on how and to what extent they transfer control of their organizations.

The successor

Another important element in the succession process is the successor. Most studies focus primarily on the role of the predecessor or founder (Kets de Vries, 1993), but

few address the role of the successor in the succession process (Davis and Tagiuri, 1989).

It is important to note that the reason for the successor's failure is often the indecisiveness of the predecessor or the successor themselves, or a lack of the skills necessary for leadership. Chrisman et al. (1998) classified the characteristics of successors into six main categories: relationship with the predecessor, relationship with other family members, family situation, abilities, personal characteristics, and participation in contemporary society.

When analyzing the characteristics of successors, the researchers sought to answer the question "what should a successor be like" rather than focusing on what they actually are.

According to Buoziute-Rafanaviciene et al. (2009), a successor is a person who will take over the leadership of an organization in the future and under whose leadership the organization will operate. The author points out that although numerous studies have addressed the origins of successors, insufficient research has been conducted on the specific characteristics of successors. Other studies, including the above-mentioned classification, also emphasize that successors can only have a positive impact on the performance of the organization if they are fully committed to succession.

In their study, Venter et al. (2005) identified the following factors as the most important for succession from the successor's point of view: the successor's motivation to take over the business, their level of preparedness, their relationship with the owner-manager, the remuneration system, trust in the successor's intentions and abilities, personal needs, and family harmony.

The role of family considerations in succession

According to Lansberg (1983), the family plays a major role in determining who will run the business. This effect is stronger in family businesses, while it is much weaker in non-family businesses. Experts agree that the most important characteristic of family businesses is that the family is actively involved in their management.

Chua et al. (1999), based on an analysis of more than 250 studies, found differences in the definitions of family businesses. The most important differences are as follows:

- Definitions often do not distinguish between the management and control of a business.
- Some definitions require family ownership and family management to coexist, while others require only one of these conditions to be met.
- Definitions requiring family ownership include different conditions: for example, ownership may be exclusively in the hands of one person or several members of the extended family.

4. Succession as a transfer of leadership within the family

According to Davis (1967), the essence of succession is that one generation transfers leadership to the next in order to ensure the survival of the family-related organization. Davis was the first to focus on the importance of succession, pointing out that the fundamental purpose of transferring leadership is to preserve the continuity of the family and the organization.

The procedural specifics of succession were analyzed in more detail by Handler (1990), who developed a process model. Handler's goal was to illustrate the "dance" between the parties during succession and to emphasize the role of planning, which involves assessing the situation of the organization and creating the conditions for succession.

Handler (1990) also highlighted the importance of conscious succession planning and had previously (1989) applied a model specifically to family businesses, where the transition of roles between predecessor and successor ultimately culminates in the transfer of management rights. Shepherd and Zacharakis (2000) take a similar approach when they describe succession as the process of transferring management rights from one generation to another, but their research is limited to family businesses.

In his classic work, *The Succession Conspiracy*, Lansberg (1988) presents a basic model for family businesses that focuses primarily on the motivations of those involved in the succession process and how these motivations evolve over time. As a result of nearly a decade of further development, the model has become a comprehensive conceptual framework that interprets the stages of development of family businesses in a life cycle perspective, linking them to the issue of succession. Based on their model, Lansberg and colleagues (1999) conclude that succession means the transfer of management and/or control powers. In this context, they raise several fundamental questions: who takes over the management of the organization, what changes accompany the transition, when does the new leader assume responsibility for performance, and how can the expected results be achieved.

In general terms, succession—as the process of transferring leadership roles within a family—is closely linked to the concept of family inheritance. In this approach, the literature explicitly interprets succession as the transfer of leadership functions exclusively within the family. A similar logic applies to organizations dealing with the elderly, where leadership responsibilities—whether formal or informal—are passed on within a small, internal circle, thereby promoting the continuity and stability of the organization's operations.

5. Succession as a transfer of leadership within and outside the family

The issue of succession involving the transfer of leadership within and outside the family has received relatively little attention in research on small and medium-sized enterprises (SMEs) to date. According to Beckhard and Burke (1983), succession is the process by which the founder transfers management authority to his or her successor, who may be a family member or even a professional manager from outside the family (Beckhard and Burke, 1983). Although this approach is rather general, it draws attention to important aspects, as the vast majority of previous literature has narrowed succession exclusively to leadership changes within the family.

Rubenson and Gupta (1997) applied a similar interpretation when they linked the succession of the founder—a phenomenon they called "early succession"—to the need for organizational transformation. According to their view, "early" succession is a context-dependent process in which the founder transfers control to other family members or external professionals.

Overall, succession can be understood as a process that involves the transfer of managerial powers. Based on this approach, the transfer of managerial powers begins with the owner or the original company manager, while the successor may be a family member or a person outside the family who is typically treated as a professional manager. In the case of associations working with the elderly, this means that the successor may be an existing member of the association, but may also be an external person who becomes involved in the association's operations and activities after being elected.

6. Conclusions

Overall, succession is not a static, one-time event, but a long-term, multi-stage organizational process during which the predecessor and successor gradually redefine their roles and responsibilities. The key factors for the success of the process are trust-based cooperation, the conscious sharing of decision-making and management competencies, and the efficiency of knowledge transfer between generations.

Although the literature primarily examines the succession dynamics of family businesses, it is becoming increasingly clear that the issue of succession is of strategic importance for all types of organizations, including the non-profit and public benefit sectors, and thus also associations working with the elderly. In the case of these organizations, succession not only ensures continuity of leadership, but also has a direct impact on the organization's social embeddedness, financial stability, and resource sustainability.

One of the most important tasks for future research and practical approaches is to develop strategic succession management models that not only facilitate effective leadership change but also support the long-term operational stability, innovative capacity, and economic and social value creation of organizations, including associations working with the elderly.

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EXPLORATORY STUDY ON THE SINCERITY OF YOUNG VOTERS' INTENTIONS IN POLITICAL MARKETING

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Abstract: *This exploratory research aims to investigate the sincerity of young Romanian voters declared voting intentions within the context of political marketing. Using a qualitative approach, the study employs focus groups as the primary data collection method. This research aims to explore young people's voting intentions, the sincerity of their declared intentions versus actual voting behavior, their perceptions of electoral responsibility, the influence of voting on their lives, and their views on the integrity of the electoral process. Focus group discussions will involve university students and other young participants aged 18 to 25. The findings are expected to provide valuable insights for political marketers and campaign strategists seeking to foster more authentic engagement with youth audiences. Additionally, the study will contribute to the broader academic discussion on the reliability of self-reported voting intentions in political research.*

Keywords: *political marketing, electoral behavior, decision-making process, voting intentions, attitude-behavior consistency*

JEL Classification: M31

1. Introduction

This article aims to investigate the behavior and sincerity of declared voting intentions of young Romanian voters from the university environment in the context of political and electoral marketing.

As a research method and implicitly for data collection, this study is based on a qualitative exploratory focus group research, the samples being made up of 8-10 students each.

From the research perspective, the elements subject to analysis were grouped into distinct categories such as: impact and relationship to the political and electoral process; voting intention and motivation; sincerity of declared intention compared to real behavior; electoral responsibility; perception of the electoral process from the perspective of integrity, fairness and correctness of the electoral process; involvement in the political campaign and prospects for improving voting participation.

Numerous examples that can be found in the specialized literature talk about the consequences and relationship to the political and electoral process (Watson, 2025; Jjuuko, Omland, Dralega, 2025).

Among the aspects related to the intention and motivation to vote, studies have shown that there is a direct correlation between these two variables (Ibrahim, Atia, 2025; Smith et al., 2025), with a direct impact on voting behavior.

Studies found in the specialized literature with reference to the sincerity of voting declarations (Khalil, 2025), (Gebrihet, Gebresilassie, 2025), in direct comparison with real behavior show that there is a sensitivity when the individual is faced with expressing their own opinions, intentions with a high degree of intimacy, such as those perceived to be above.

Research found in works on social responsibility reveals (Radavoi, 2025; Zhang, Y., Hou, T., Matsuoka, 2025; Lappeman et al. 2025) that individuals, and especially young people, have a high degree of awareness of the importance of their electoral act despite quasi-generalized opinions and imported by the collective mind that this is not the case. The configuration of the vote in elements with a strong figurative imagery is proof of the fact that there is a strong degree of intrinsic significance of the personification of the act of voting.

Similarly, studies in the specialized literature attest to the fact that perceptions of the integrity of the act and the electoral process have a close connection with the personality and character of the individual, these being transposed also in terms of the fairness of the electoral process as a whole. Individuals with a high degree of social fairness tend to have opinions consistent with these attitudes (Santolamazza, 2025; Gebrihet, 2025; Che et al., 2025).

The effectiveness of electoral campaigns among young people (Stepaniuk and Misiewicz, 2025) and not only that, along with improving youth participation in voting, are closely linked to social networks, as a component of the online environment with a direct impact on future behaviors (Alsaleh et al., 2019; Chahal et al., 2020; Jamil et al., 2022). This aspect is proven in numerous specific studies and specialized works. One way or another, all types of modern social networks impact on both general human psychological processes and also on specific behavioral ones, whether it is Facebook (Luarn et al., 2015; Clark and Çallı, 2014), Twitter/X (Cerasi et al., 2023), Instagram (Torregrosa et al., 2023; Ramdani and Belgiawan, 2023), YouTube (Dehghani et al., 2016), but especially TikTok (Meng and Leung, 2021; Wahid et al., 2023).

The ways and means of stimulating the increase of participation and presence in the act of voting are not only of a material nature but also psychological (Dodson, 2025; Sasu, Popa, Țarcă, 2023)

2. Research Methodology and Results

The purpose of this study is to investigate, from the perspective of political and electoral marketing, the voting intentions, motivation and degree of sincerity in which young people participate in the political and electoral process, especially in voting, and what are the factors that influence their behaviour (Fishbein & Ajzen 2010; Gerber et al., 2008; Stromback et al., 2013)

This study employs a qualitative, exploratory focus group methodology, using an analysis grid as the primary research instrument comprising seven key dimensions: voting intention, voting motivation, voting sincerity, electoral responsibility, perceptions of the electoral process, integrity, and influencing factors. The target population consists of students from the Faculties of Economic Sciences and Visual Arts at the University of Oradea. A total of seven focus groups were conducted, involving 102 participants, with the final analytical sample including 100 respondents. The demographic characteristics of the participants are presented in Table 1 below. The present research aims to achieve the following specific objectives:

O1: Exploring young people's voting intentions and motivations

O2: Analysing declared sincerity versus real behaviour

O3: Defining the elements of influence

O4: Presenting how young people perceive electoral responsibility through an imagological perspective

Table 1: Demographic characteristics of respondents

Variables		No. of respondents	%
Gender (n=100)	female	75	75,00%
	male	25	25,00%
Age groups (n=99)	<21	14	14,14%
	21	20	20,02%
	22	21	21,20%
	23	28	28,28%
	>23	17	17,17%
Residential environment (n=98)	urban	55	56,12%
	rural	45	45,90%

Source: Own research

O1: Exploring young people's voting intentions and motivations

This objective seeks to examine voting participation and to identify the factors that motivate voter turnout. The analysis sheet includes four categories of questions addressing these aspects. Findings indicate that discussions and engagement related to the political and electoral process occur predominantly only during election periods (74.3%), while less frequent involvement is reported rarely (19.6%) or not at all outside electoral contexts (5.1%). These patterns align, to some extent, with the correlation analysis conducted in relation to voter turnout. **Figure 1**

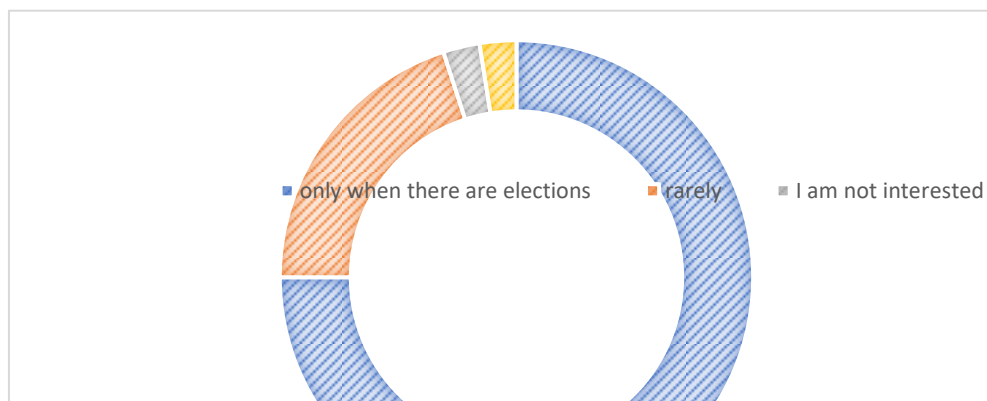


Figure 1: Interaction with the electoral process
Source: Own research

Thus, for the question "What motivated you to vote?", on a scale from 1 to 5, the score obtained is 4.8 in terms of responsibility and awareness of the importance of each vote, followed by the desire for change with 4.3, because I care 3.8 **Figure 2**

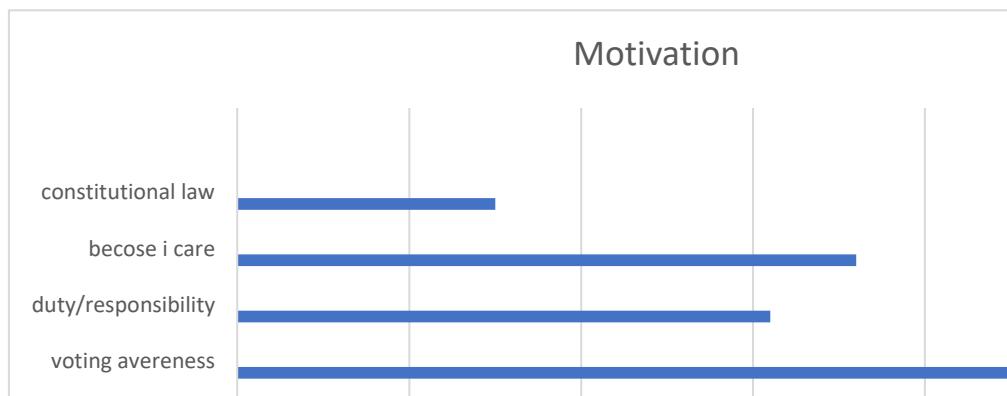


Figure 2: Motivation for voting
Source: Own research.

Another category of motivating factors is represented by the candidate's traits, where we can see that by analysing the responses, the descending order of frequencies are, going from the most frequently invoked attribute to the least, the following, on a scale with a maximum score of 15: wisdom (15), education (10), charisma (7), political program (6), sincerity and past (4), knowledge, character, honesty (3). Other attributes invoked are principles, open-mindedness, empathy, modesty, seriousness, achievements, and reasoning. **Figure 3**

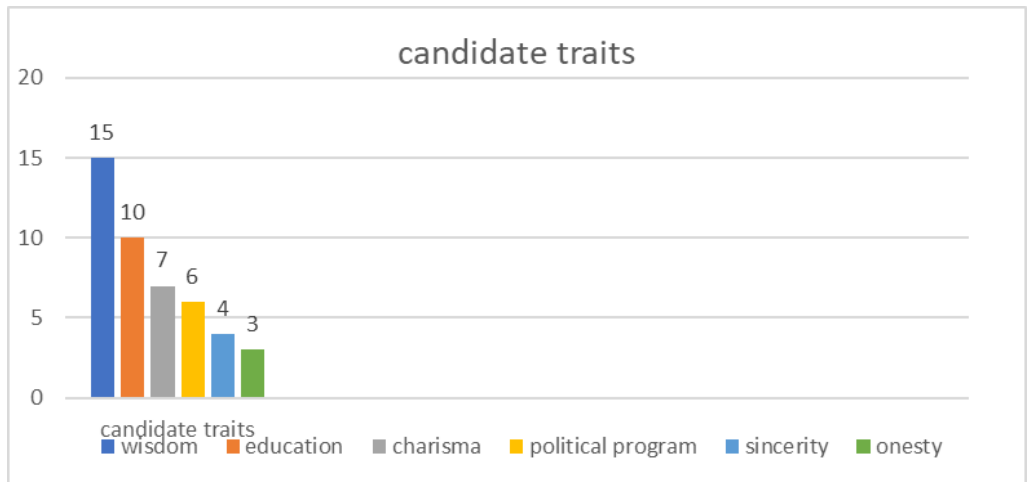


Figure 3: Candidate traits

Source: Own research.

O2: Analysis of declared sincerity vs. actual behaviour. Analysing the statements of the young people investigated, most of them stated that there is a high degree of sincerity between the declarative statements regarding the participation in voting of young women (89%, respectively 86% of men) and the actual voting behaviour.

Table 2: Gender-based comparative analysis of mass media information usefulness

What do you think is the degree of sincerity between those who participate in the vote and those who actually go?	Yes	No
Female	88.69%	11.31%
Male	86.14%	13.86%

Source: Own research

O3: Defining the elements of influence among the most significant factors of influence regarding the vote of young people, the results showed the following in descending order: mass media and social media and especially tik-tok (60%), core family (50%), friends, (20%), influencers and reference groups (6%), shows, podcasts (3%), political debates (2%). **Figure 4.** These elements are correlated with the characteristics of the candidate, where his composite attributes are listed, such as: wisdom/reasoning/thinking (60%), education, political program, achievements, sincerity, past, character, charisma, empathy, integrity, open-mindedness, modesty, principles, flexibility/versatility. **Figure 5**

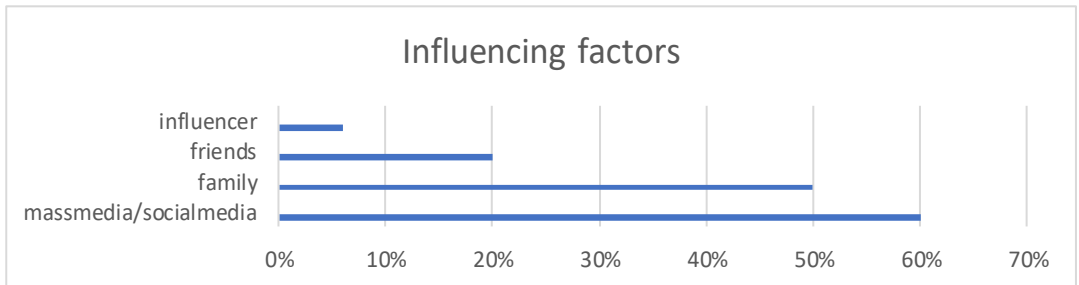


Figure 4: Influencing factors- external factors
Source: Own research.

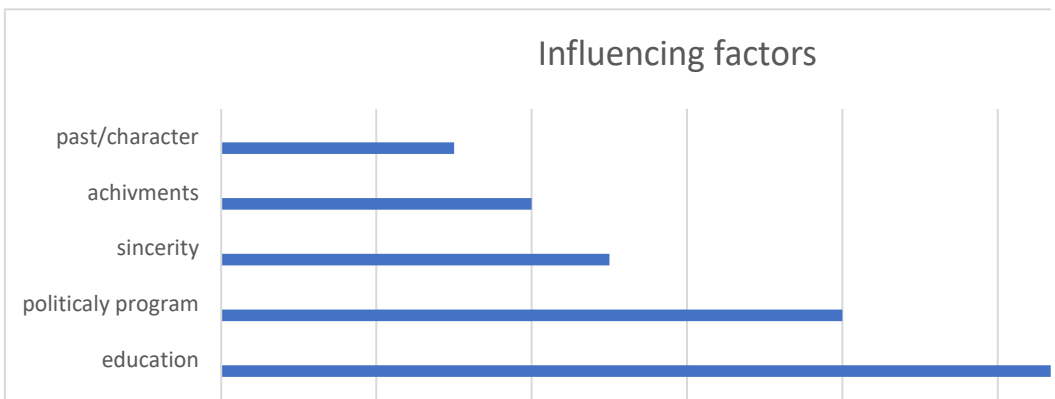


Figure 5: Influencing factors- candidate
Source: Own research.

O4: Presenting how young people perceive electoral responsibility through an imagological perspective

The component of this objective involves the imagological analysis of the perception of the electoral process integrity. The opinion that the elections are seen to be fair (93%) and (91%) is clearly distinguished.

Table 3: Gender-based comparative analysis of mass media information usefulness

Do you think the elections are being conducted fairly?	Yes	No
Female	93.43%	6.57%
Male	91.56%	8.44%

Source: Own research

The imagological component of the research, reflecting how the electoral process is perceived, covers a wide range of elements that carry both material and psychological significance. These representations are shaped by a strong political and electoral marketing perspective and may serve as a basis for further analyses and future research directions. The most frequently mentioned associations include:

motor vehicle, pen/pencil/writing instrument, telephone, water, seed, shield, stamp, hose, door, jeans, mirror, circle, magic wand/hat, key, diamond, bed, microphone, glasses, mobile phone, weapon, and hammer.

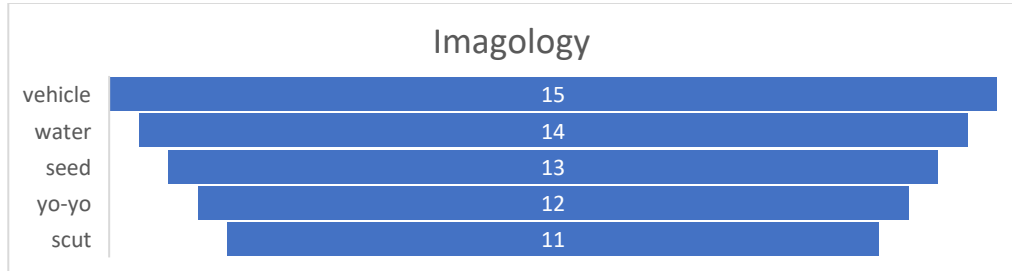


Figure 6: Imagological component

Source: Own research.

5. Conclusions

The results of this study should be interpreted with caution, as it was designed as a pilot project to open the door to further studies in the context of the addressed theme. The target population of the research is students of the Faculties of Economic Sciences and Visual Arts of the University of Oradea. According to this study, the voting intention of students and the influence of mass media on behavior are assessed as moderate, and a gender analysis shows that female students perceive information from mass media as more useful than male students. Regarding the actual electoral behavior and especially voting, it is worth mentioning that the main reasons for voting are the direct influence of social media and the basic family, closely followed by the characteristics of the candidate.

The analysis reveals some interesting findings regarding increased responsibility and awareness of this duty seen through the lens of sincerity, at least of the respondents, and it seems that a significant relationship was found between sincerity expressed as voting intention and actual post-voting behavior and dependence on social networks.

We can say that this type of exploratory qualitative research, which is intended to provide insights into the political and electoral behavior of young people and the correlation with influencing factors in particular, can be a valuable resource for marketing specialists interested in understanding the dynamics of youth involvement in the political and electoral process.

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EMPIRICAL STUDY ON THE CONSUMER PREFERENCES AND BUYING BEHAVIOR IN THE COSMETICS INDUSTRY MARKET

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Abstract: *This paper was carried out with the aim of determining the preferences of consumers in the municipality of Oradea, with regard to cosmetic products, marketed by both multinational companies and local ones in Romania. Also, as a result of the study carried out on a simple, non-stratified representative sample, data were obtained regarding the purchase locations, the factors that influence their purchase decisions, the frequency of purchase and use of cosmetic products, as well as the brands and types of products preferred by to them. In order to carry out this study, a questionnaire with closed dichotomous, multichotomous and mixed questions was created, which was applied to a representative sample of 250 subjects, residents of the municipality of Oradea.*

KEYWORDS: *Cosmetics Market, Preferences of Consumer, Buying Behavior, Purchase Decision, Perceptions, Questionnaire, Sample*

JEL Classification: C83, F20, D47, L66, M31, M37, M51

1. Introduction

The Romanian market of cosmetic products is a heterogeneous, strongly stratified market, the offer includes both cheap, "no name" products, of very low quality, but whose success is based on the consumer's lack of information and money, as well as sophisticated products and prestigious brands on the international market.

The practical framework consists in carrying out quantitative research carried out with the aim of determining the preferences of consumers in the municipality of Oradea, regarding the cosmetic products, marketed, both by multinational companies and by domestic ones in Romania.

Also, as a result of the study carried out on a simple, non-stratified representative sample, data were obtained regarding the purchase locations, the factors that influence their purchase decisions, the frequency of purchase and use of cosmetic products, as well as the brands and types of products preferred by to them.

In order to carry out this study, a questionnaire with closed dichotomous, multichotomous and mixed questions was created, which was applied to a representative sample of 250 subjects, residents of the municipality of Oradea.

2. Theoretical Background

2.1. The world market of cosmetic products

The global cosmetics market is dynamic and significant in size. Swiderska et al (2023) opines that the cosmetic products' market is constantly expanding its influence to different target audiences and covers all classes of consumers. but most likely taking into account the epidemiological context, in 2023, the global cosmetics market decreased by approximately 8%, compared to the previous year. Fatriasari et al (2024) consider that the global beauty industry showed resilience, quickly recovering the loss recorded during the health crisis (-7.7%) and reaching in 2023 a value of approx. 378 billion Euros. Kukhta et al (2023) claim that demographic changes, the increase in incomes and the number of people in the middle class, complemented by the degree of penetration of purchase experiences (testing, consulting, actual sale) in the online environment represent market growth factors, both in Romania and at the international level. International retail purchases are facilitated by e-commerce and the digitalization and communication efforts made by brands even during the pandemic.

In Euromonitor (2025) we can read that the global cosmetics industry recorded a 16% increase in 2024 compared to 2023, supported by sales of cosmetics and perfumes. At the European level, the market was estimated at approx. 125 billion Euros in 2024, being considered a fairly mature market, with a growth forecast indicating an average annual rate of 1.6% for the period 2024-2028, supported mainly by the Cosmetics and Skin Care segments. According to Yin (2024), skin and hair care products, make-up/decorative cosmetics, toiletries, such as perfumes, eau de toilettes or deodorants and cavity care cosmetics oral, are the main product categories of the cosmetic market. Skin care products are considered the market leader in this segment, representing approximately 42% of the global market and this category of cosmetics obviously represents the most significant growth in this regard, estimating - a value of approximately 177 billion dollars, until 2026. Analyzed individually, the market of anti-aging products is estimated to exceed, in the near future, 34.49 billion dollars, with an annual growth rate of 7.3%.

Fatriasari et al (2024) consider that a trend manifested worldwide is the reduction of the gap or difference between products intended for the mass market and those targeting the luxury / premium segment, due to mass brands that use the technology specific to premium products, while still offering them at affordable prices. Well-known companies operating in the global cosmetics industry have already announced their future, innovative strategies to meet the latent and insufficiently satisfied needs of certain categories of consumers.

2.2. The Romanian market of cosmetic products

The Romanian market of cosmetic products is a heterogeneous, highly stratified market, with fierce competition, the offer including both cheap, "no name" products, of very low quality, but whose success is based on the consumer's lack of information

and money, as well as a few Romanian names, a few producers with a long tradition, but also sophisticated products and prestigious brands on the international market. The main advantages of imported products are: superior quality obtained on the basis of major technological innovations, special design, both in terms of color, shape and quality of materials, easy, convenient and hygienic use of cosmetic products. The brands are recognized worldwide, which is why they are easily accepted, even desired by the Romanian consumer. Lupoiu et al (2024) believe that the promotion system, namely advertising, the sales force, relations with the public and sales promotion are much better organized, both due to a wider experience in this field and due to financial resources. Romanian producers are based on tradition, on the high notoriety enjoyed by their products and on the trust of consumers in them. They market large lines of products that address all segments of the population, and the prices are lower than those of imported products. However, once the buyer tests the products offered locally, he is often convinced of their quality and becomes a loyal customer of the brand. Financial resources in Romania are smaller than in other European countries, so even local producers have a harder time sneaking among the public's preferences. The local cosmetics market is below the European development average, due to the imbalance of financial resources available in Romania compared to other European states, but also to the size of the local cosmetics market compared to markets such as France, Germany or Spain. Many of the personal care products have prices that are not necessarily affordable, and economists' fears were that the pandemic will have a negative impact on sales and, implicitly, on profits. However, the surprise was major: the sales trend until the end of 2025 was an overall upward trend. Although international cosmetics remain the main players in the industry, the Romanian market is on an upward trend, which can be characterized by a refinement of consumer preferences, which now show more elaborate requirements, determined by the increase in information about care products and to their particularities. The gratifying trend is that Romanians are moving towards higher quality, advanced products, with proven effects in the medium and long term and which are based on the latest generation ingredients. As long as Romanian companies are able to offer this, the occasional buyer becomes a customer.

What is behind the upward trend of Romanian cosmetics? Marcu et al. (2024) consider that the refinement of buyers' tastes is the main reason why serious producers of Romanian cosmetic products have managed to grow on the market, even in such a difficult period for all industries. It is about "the maturing of the Romanian consumer, who begins to have more confidence in what is produced in the country, at the local level".

What is behind the upward trend of Romanian cosmetics? Georgescu (2024) in Biz Magazine consider that the refinement of buyers' tastes is the main reason why serious producers of Romanian cosmetic products have managed to grow on the market, even in such a difficult period for all industries. It is about "the maturing of the Romanian consumer, who begins to have more confidence in what is produced in the country, at the local level".

The Romanian cosmetics industry has to face important challenges. Mombekov et al (2024) claim that the limited sales market is one of the most important problems faced by manufacturers. The large chain stores limit the number of items presented

on the shelf, so many products in the range remain unknown and unpromoted, despite the fact that they are competitive in terms of price and quality. Also, local brands are not as well-known as international ones because they are not equally promoted both online and offline. Turdean (2023) believe that Romanian brands would be strongly stimulated by the reduction of excessively bureaucratic procedures and the foundation of certain measures simplified. The limited budget for promotion is another reason why many Romanian products of good quality remain in the shadows. Romanian cosmetics companies have a limited marketing budget compared to international brands, which during the pandemic, invested heavily in advertising. Turdean (2023) consider that the international competition comes with huge promotion budgets, which we cannot match, so we seek to compensate with the quality and honesty of the products. The purchase of raw materials is often made at high prices, from abroad; under these conditions, it is a permanent effort to maintain the prices in an appropriate range, which would make the products competitive on the market. State aid is almost non-existent, so Romanian investments and local businesses are not stimulated at all. Bisa (2024) claim that the major challenge for the Romanian cosmetics industry is the lack of local suppliers of raw materials, which require companies to buy them from imports. At the same time, there are very few state aid strategies to stimulate Romanian investments and provide certain benefits for local businesses.

An important aspect is the fact that in Romania, too, the consumption of deodorants and antiperspirants has registered some progress.

The beauty industry in Romania has registered an upward trend in recent years (2018-2024 period), registering an average annual growth rate of 3.1% and reaching at the end of the analysis period a value of around 1.5 billion Euros. Bisa (2024) in Virtual Board consider that sales of cosmetics (CAGR 5.1%) and skin care products (3.7%) were the drivers of market growth, closely followed by the fragrance segment (3.6%). Analyzing the data from the market study carried out by KeysFin (2025) for the period 2018-2024 we observe a favorable evolution regarding the growth of the market for personal care products. With a share of 44% of the total market value, body care products reflect a mature market segment.

In eToro Retail Investor Beat (2025) we can read that It is certain that there will be some small corrections in the level of demand in the next period, but we can say for sure that for the forecast period (2024-2028) we are heading towards an increase in the local market (CAGR 2.3%). This will be supported by the Cosmetics segment (CAGR 3.8%), followed by perfumes (CAGR 2.4%) and Skin Care products (CAGR 2.3%). We are facing a time when consumers are focusing on quality products, with multiple benefits and clinically proven results, to ensure their well-being, safety and sense of comfort.

It is estimated that the market for skin care products will reach about 177 billion dollars by 2026. The pace is slightly lower than that of the period 2018-2024.

Thus, the cosmetics and perfumery market in Romania will grow by 2.3%, on average, annually, until 2027, according to an analysis by Virtual Board (2025) a platform for democratization of managerial information that integrates artificial intelligence solutions in consulting activity managerial. For comparison, the average annual rate from 2018-2024 was 3.1%, according to the same source.

The beauty market in Romania will register a growth (2.3%) supported by consumers' interest in quality products that ensure their overall well-being. Edis et al. (2024) believe that the general trend is towards a healthy lifestyle that motivates the consumption of natural and organic products, including dermatocosmetics (associated with sale in pharmacies)

In Environmental Working Group (2025) we can read that the cosmetics segment remains the driver of the beauty and personal care industry, with a forecasted sales growth of 16% in 2027 vs 2023, to the value of 270 mil. Euro.

A survey carried out by Picodi.com (2024) reported that Romanian women spend an average of 2057 lei on cosmetics annually. Among the respondents, 51% stated that they purchase organic cosmetics only if the price is convenient, 34% buy regardless of the price, and 14% show no interest in organic ingredients.

In eToro Retail Investor Beat (2025) we can read that between 2020 and 2024, the Romanian market for solid deodorants (sticks) grew by 12.8% in volume, while the segment represented by aerosol deodorants (sprays) decreased by 14.6%.

The SNS Insider report (2025) indicated that in terms of value, the volume of sales of solid deodorants increased by 8.1%, while that of aerosols decreased by 12.3%. The data refer to the first six months of the mentioned years and they reflect the sales recorded in commercial units that practice retail sales, excluding hypermarkets.

If three years ago, the deodorant market was dotted, in terms of media, by a series of smaller or larger players, in recent times, TV media budgets are exclusively awarded to brands belonging to international players.

Pryor et al. (2023) consider that also interesting are the trends in recent years in this market, which consist of educating consumers about choosing antiperspirant or skin-care deodorants, to the detriment of those consumers who make their purchase decisions solely based on smell. As with many other products (detergent that not only washes but also protects fabric; dishwashing detergent that not only cleans but also protects cars), this educational trend, aimed at balancing the market, from the point of view of the purchase decision, is one promoted by the major deodorant manufacturers.

Ustyenko (2023) believe that the sales of dermatocosmetics are expected to increase as a way to meet the growing demand for healthy, youthful-looking skin. Many of them are distributed through pharmacies, which contributes to strengthening the image of high-quality products with healing effects. Navickaitė et al. (2023) consider that emphasis will be placed on natural ingredients such as thermal water or marine mud and on paraben-free products.

3. Methodology

3.1. Introduction

In order to support the aspects related in the theoretical framework, I considered it necessary to carry out descriptive research thought in this way to provide an image at a given moment of a situation in the chosen field. The survey was used as the primary data collection method, and the questionnaire administrated to a

representative sample of respondents was used as a research tool specific to the survey.

In this section of the paper, the research is presented with all the steps taken. The purpose established in order to carry out the research was to identify the preferences of consumers in the municipality of Oradea, regarding the cosmetic products, marketed, both by multinational companies and by domestic ones in Romania.

Starting from this goal, four key objectives were penciled in: the degree of information of the population regarding the offer of cosmetic products on the Romanian market; the need to inform the population about how to use cosmetic products, as well as their action; the degree of perception of the demand for cosmetic products related to the area under analysis; the degree of satisfaction of the level of demand by the supply of foreign and domestic manufacturers of cosmetic products.

The second major part of the work is divided into three chapters. The first chapter presents the research methodology. The second chapter covers the questionnaire designed to be applied. In the third chapter, the results are interpreted, punctually for each question, the answers obtained being partially illustrated, the complete questionnaires being attached in the appendices. The information analysis was carried out through content analysis.

3.2. Research methodology

The research method chosen was a quantitative, descriptive research method and one of the most frequently used methods of collecting primary data, namely the survey. It contributes to the analysis of the way in which consumers of cosmetic products in Oradea perceive the quality of purchased cosmetic products, as well as to the estimation of the share of the total population of Oradea municipality of people oriented towards concerns regarding body hygiene. As a research tool specific to the investigation, the questionnaire administered to a representative sample of respondents was used, the purpose of its application being to obtain information directly from the consumers of cosmetic products in the municipality of Oradea regarding the subject of the discussion.

The information expected to be obtained from this research is quantitative information. The questions that formed the questionnaire were dichotomous, multichotomous and mixed closed questions, which were applied to a representative sample of 250 subjects, residents of the municipality of Oradea.

This research was used with the aim of identifying the preferences of consumers in the municipality of Oradea, regarding cosmetic products, marketed by both multinational and local companies in Romania.

4. Data analysis and results

4.1. Questionnaire

Purpose: Identifying the preferences of consumers in the municipality of Oradea regarding cosmetic products, marketed by both multinational companies and local ones in Romania. Also, as a result of the study carried out on a simple, non-stratified

representative sample, data were obtained regarding the purchase locations, the factors that influence their purchase decisions, the frequency of purchase and use of cosmetic products, as well as the brands and types of products preferred by to them.

Objectives: - identifying the consumer opinions regarding:

- the level of information of the population regarding the offer of cosmetic products on the Romanian market
- the need to inform the population about how to use cosmetic products, as well as their action
- the degree of perception of the demand for cosmetic products related to the area under analysis
- the degree of satisfaction of the level of demand by the supply of foreign and domestic manufacturers of cosmetic products.

4.2. Interpretation of results

Table 1: Frequency of responses shopping location

Frequency of responses		
Answer option	No of respondents	Percent (%)
A	41	16,4
B	11	4,4
C	85	34
D	41	16,4
E	90	36
F	10	4

Frequency of responses

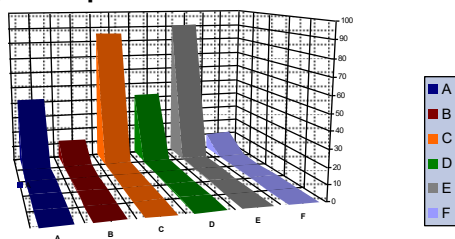


Figure 1: Frequency of responses shopping location

Regarding deodorants, the balance between supermarkets and specialized stores, according to their main function, tilts very slightly in favor of specialized stores (90 - 36%), which outrank supermarkets (85 - 34%), with specialty distributors and markets or stalls in equal third place (41 - 16.4%).

Table 2: Frequency of influencing factors of the purchase decision responses

Frequency of responses		
Answer option	No of respondents	Percent (%)
A	15	6
B	135	54
C	6	2,4
D	118	47,2
E	45	18
F	18	7,2
G	3	1,2

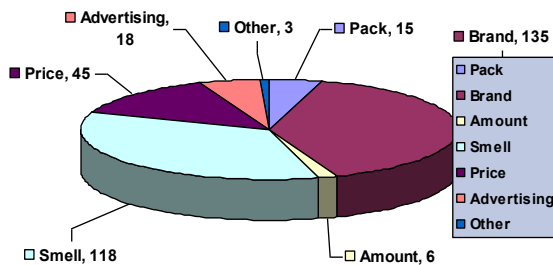


Figure 2: Frequency of influencing factors of the purchase decision responses

Analyzing the results of the study, it was found that, among the factors that contribute to the decision to purchase a deodorant, "brand" (135 - 54%) represents the leader of the subjects' options, followed closely by the challenger factor "smell" (118 - 47.2%), and by the "price" factor (45 - 18%). Other factors such as "packaging", "quantity" or "advertising", recorded low weights in the portfolio of factors determining the purchase decision.

Table 3: Frequency of purchase frequency responses

Frequency of responses		
Answer option	No of respondents	Percent (%)
A	30	12
B	105	42
C	76	30,4
D	25	9,2
E	11	4,4
F	5	2

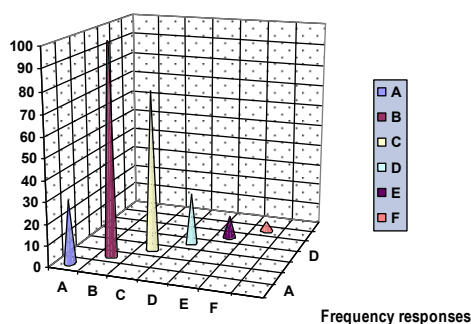


Figure 3: Frequency of purchase frequency responses

Most of the subjects (105 – 42%) usually purchase deodorants at intervals of 3-4 weeks, followed by 30.4%, i.e. 76 respondents, who have a purchase frequency of 1-2 months. It is also worth noting that only 11 respondents, i.e. 4.4%, purchase them at intervals of more than 4 months.

Table 4: Frequency of purchase responses decisions

Frequency of responses		
Answer option	No of respondents	Percent (%)
A	225	90
B	5	2
C	10	4
D	5	2
E	5	2
F	1	0,4

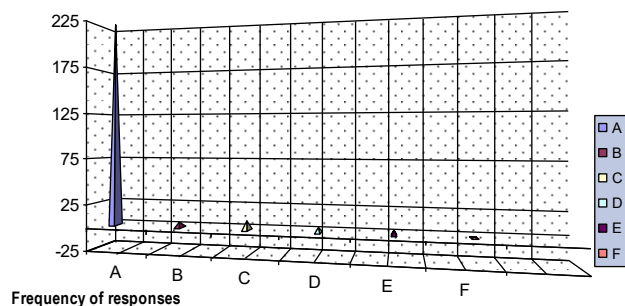


Figure 4: Frequency of purchase responses decision

The frequency of purchasing deodorants depends on the weight, skin type and the types of deodorant used (spray, solid, roll-on, etc.). Similar to face creams, deodorants were found to be frequently used by respondents, with the share of those who usually use them at least once a day being 90% (225 respondents).

Table 5: Frequency of brand preferences responses

Frequency of responses		
Answer option	No of respondents	Percent (%)
A	121	48,4
B	61	24,4
C	43	17,2
D	45	18
E	30	12
F	23	9,2
G	5	2
H	10	4

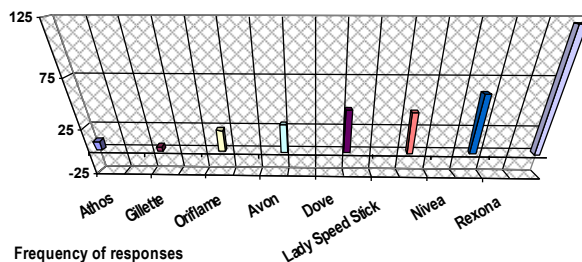


Figure 5: Frequency of brand preferences responses

The leader in the top of brand preferences on the deodorant market is the Rexona brand, with a share of 48.4% (121 respondents), followed closely by the challenger brand Nivea, which is preferred by 24.4% of the subjects. It is worth noting that the local brand Athos (10 – 4%) is better rated than the Gillette brand (5 – 2%).

Table 6: Frequency of type of deodorants used responses

Frequency of responses		
Answer option	No of respondents	Percent (%)
A	75	30
B	18	7,2
C	61	24,4
D	40	16
E	68	27,2

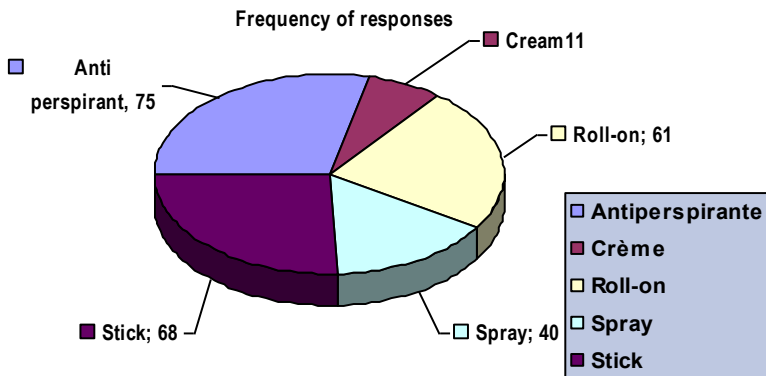


Figure 6: Frequency of type of deodorants used responses

30% (75) of the respondents use antiperspirant deodorants, but the stick also holds a significant market share of 27.2% (68). However, depending on consumer expectations and needs, spray and roll-on deodorants have lower shares in the top of consumer preferences (16% and 40%, respectively).

Due to low incomes, 60.4% of respondents are not willing to spend more than 25 lei/month on deodorants, 11.2% of them are willing to allocate an amount between 25 lei and 50 lei of their income for deodorants, while only 20% are willing to spend more than 50 lei on the purchase of deodorants.

The largest share (35.2% women, 10.8% men) of the surveyed subjects is among those aged 14-25, gradually decreasing as they get older, to those aged 26-35 (20.4% women, 5.6% men). The number of men surveyed who are over 36 years old is small (5 men), compared to that of women (63 women).

5. Conclusions

Looking as a whole, we therefore observe that the Romanian market of cosmetic products is a heterogeneous, strongly stratified market, the offer includes both cheap, "no name" products, of very low quality, but whose success is based on the consumer's lack of information and money, as well as sophisticated products and prestigious brands on the international market.

Following the interpretation of the results of the questionnaire administered to the 250 residents of Oradea, the conclusion can be drawn that they prefer the products of multinational companies, which operate on the market of our country, to the detriment of those made and marketed by local producers. Despite the fact that they do not have a purchasing power comparable to that of consumers in the countries of origin of the mentioned foreign companies, nevertheless, due to the notoriety of these brands with tradition on the world market, the subjects surveyed prefer to purchase branded products, having the conviction that they will satisfy their needs better than domestic products.

Although international cosmetics remain the main players in the industry, the Romanian market is on an upward trend, which can be characterized by a refinement

of consumer preferences, which now show more elaborate requirements, determined by the increase in information about care products and to their particularities.

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THE ADOPTION OF MOBILE OUTFIT RECOMMENDATION APPS: A PRELIMINARY STUDY ON YOUNG USERS

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Abstract: *The present paper addresses the willingness of young consumers to adopt a mobile application designed to recommend daily outfits and wardrobe organization suggestions. As digital technologies continue to shape everyday life, young consumers are increasingly engaging in mobile solutions that support not only efficiency but also self-expression. The study aims to investigate the motivations behind the acceptance and utilization of such an application, with a focus on how technology integrates into fashion-related routines. Employing a mixed-methods approach, the research combines a quantitative survey that explores how perceptions of usefulness, ease of use, and fashion consciousness influence usage intent and a qualitative analysis of in-depth interviews with potential users. The quantitative phase gathered data from 102 participants aged predominantly 14 – 24, and the findings showed a positive attitude toward these digital tools, especially when they offer emotional value such as inspiration and creativity, alongside functional benefits like timesaving and organization. The qualitative phase explores the lived experiences and perceptions of individuals regarding the application's potential benefits, limitations, and integration into their daily routines. A noticeable gap emerges between the interest in using and the willingness to pay, highlighting the challenges in monetizing fashion-app products for younger audiences. The findings have implications for app developers and marketers in creating the design and promotion of such technologies to enhance user engagement and market penetration in a digital landscape. By connecting digital adoption with lifestyle and emotional drivers, this research contributes to a deeper understanding of how youth engage with mobile fashion technology. Future research should explore the longitudinal effects of app usage on fashion decision-making and investigate the role of social influence and personalization features in driving adoption.*

Keywords: *Artificial Intelligence; mobile fashion app, youth engagement; wardrobe recommendations.*

JEL Classification: *M31; M15; O32*

1. Introduction

Digitization is developing at an ever-increasing speed as the young people of "Generation Z" are showing interest in the usefulness of mobile applications and integrating them into everyday life, supporting free expression and style. Technology is an integrated part of young people's lives, from social networks,

journaling apps, productivity tools, to AI and fashion. In this context, apps for wardrobe organization, fashion apps and outfit recommendations or outfit combination suggestions are starting to play an increasingly visible role, combining technology, organization, time saving and creativity.

Young people use fashion as a means of symbolic communication and self-image construction (Solomon, 2018) according to the literature. With the high consumption of artificial intelligence and the complexity of mobile applications, digital solutions that promote a more organized, personalized and inspirational approach to the process of choosing outfits have started to emerge (McKinsey & Business of Fashion, 2023). This article will analyze young people's reaction to digital wardrobe applications, their expectations, motivations and the extent to which they show a sustainable attitude towards them. The study builds on the Technology Acceptance Model (TAM) (Davis, 1989), adding elements of consumer behavior to understand the value associated with these tools, not just the perceived usefulness. Both the functional elements are taken into account: productivity, organization, time saved, and the affective elements: creativity, self-expression, highlighting the emotion associated with these elements, not just their utility.

The motivation for the theme stems from the lack of addressing these trends in current research and the need to create a basis for the development of clothing applications with a focus on the person. Although mobile apps are on the rise in the fashion-tech field, research focused on understanding young consumers' behavior towards these tools remains quite limited.

Much of the studies focus on macro aspects or commercial trends and omit the micro side, where users adopt technology in their day-to-day clothing habits (Davis, 1989). It emphasizes the lack of analysis of affective components when selecting outfits, not just their utility: mood, desire for perception and highlighting identity. Thus, an outfit recommendation and organization application is not just a digital tool, but becomes a tool for expressing personality.

2. Theoretical framework and literature review

The fashion industry has been deeply influenced by digital trends lately, with an increasing number of studies referring to technology in the fashion field. "Digital fashion" means integrated mobile applications, augmented reality, artificial intelligence and real-time personalization, which is considerably more than e-commerce or advertising. Recent studies reflect the users' desire to organize their wardrobe, simulate outfits, receive suggestions and simulate all this on an avatar. (Vogt, C.A., Bao, E. & Erkip, F. (2021). The existing Smart Closet or Wearable apps already on the market are popular among Generation Z due to the advanced functions they offer: digital organization of clothes in the wardrobe and outfit generation with AI. These features denote the transformation of an intuitive act into a digitally guided process. Research conducted on Generation Z underlines the responsiveness of young consumers and their willingness to be more open to interactive applications, characterized by simple design and content tailored to their mood or daily context Hollebeek, L.D., Sprott, D.E. & Andreassen, T.W. (2024). Social networks such as Instagram, Pinterest and TikTok are influencing clothing trends, raising consumer expectations about the accessibility and interactivity of applications tailored to current trends. Outfit and clothing choice is a process of

expression influenced by affective factors pertaining to: affective dimensions, emotional drivers, psychological factors, not just a usual practical action. The authors (Li & Zhang, 2023) convey the high demand for the integration of Artificial Intelligence (AI)-based options that the recommendations offered are in tune with the context, weather, daily activities and learning the user's style. Although the demand and potential of these applications are very high, there is reluctance in the process of monetizing these applications; the younger generation wants such applications but is reluctant to pay the necessary costs for advanced features (Perry, A. (2016). However, current research is limited to the integrated analysis of functional and emotional factors influencing the usage decision. Present studies are focused on the technical side or consumption motivations, without connecting the two dimensions in the context of creating a mobile application for outfit recommendation, despite these two directions seeming to influence each other in the context of the adoption process of mobile outfit recommendation applications. Therefore, this study brings to light some answers to complete the theoretical and practical gaps by integrating a dual framework, Technology Acceptance Model formulated by Davis (1989), with elements from consumer behavior theory. mixed methods The theory defines a functional factor: utility which emphasizes the concrete benefits that the user believes will accrue and an affective factor: perceived ease of use which determines the user's intention to adopt the technology. By combining the two factors the study aims to provide an analysis of how young people are willing to adopt virtual wardrobe applications.

3. Research Methodology

In this study we opted for a mix method, analyzing the quantitative component through an online form and the qualitative component through interviews with young people from Generation Z. The chosen method helps to analyze in detail the intentions and perceptions of young people in the context of the use of mobile applications in the fashion field and gives us clarity on behavior by supplementing with qualitative data. In terms of methodological literature (Creswell, 2014; Bryman, 2016), mixing methods permits us to triangulate results and increases the credibility of findings in exploratory consumer behavior research.

3.1. Quantitative component - online questionnaire

By means of a form we collected data based on the TAM model (Davis, 1989) and elements of consumer behavior theory. The form was filled out between March 15 and April 15, 2025 via Google Form and distributed to focus groups of young people, college and high school students with a non-probability, convenience sampling technique commonly used in exploratory studies of this type (Saunders et al., 2019).

This form collected 102 valid responses with no missing values and fully completed, indicating a level of completeness of responses for descriptive analysis. The age range of the respondents is between 12 - 24 years old, balanced in terms of gender and education level: high school, college, and young employed. The age group is part of Generation Z, known for their high degree of digitization and receptivity to mobile applications (Seemiller & Grace, 2019).

The questionnaire was composed of three main sections:

1. Sociodemographic data such as age, gender and occupation
2. Items based on TAM questions regarding perception of usefulness, ease and intention of use and general attitude towards clothing organization applications.
3. Behavior and reactions to fashion and technology, questions referring to dressing habits, need for organization, sources of inspiration, interest in AI features, willingness to pay, relationship with clothes.

A Likert scale with 5 levels from "strongly disagree" to "strongly agree" was used for most of the questions in order to analyze the position of the interviewees in relation to the proposed ideas (Ajzen, 1991). There were also single or multiple-choice closed-ended questions and self-evaluation parts to analyze the frequency of different behaviors. The form had a twofold purpose: to verify young people's interest in such outfit recommendation applications and whether they are willing to pay for these features. The responses were analyzed and processed in Microsoft Excel using basic statistical tools (means, frequencies, standard deviations) to highlight response patterns and correlations between the variables analyzed.

3.2. Qualitative component - semi-structured interviews

The quantitative research was complemented by six individual semi-structured interviews with the participants who filled in the form and expressed their agreement to complete the analysis. The participants are from different spheres: women and men, students and employees, fashion enthusiasts or just moderately interested to highlight the difference between the ways of reporting to the organization, mobile applications, clothes and recommendations.

Interviews were conducted physically, face-to-face. The time allotted varied between 20 - 30 minutes, and the questions covered:

- organizing your wardrobe
- choosing your daily outfit
- using fashion applications
- useful features in an application of this type
- availability of payment

The interviews were analyzed in an exploratory way by looking carefully for repeated ideas and relevant perspectives. Participants expressed their desire related to simple usability, the desire to visualize outfits, simulating an avatar similar to the person, time-saving and sharing with other users, especially friends and close acquaintances.

These responses shape the picture obtained from the form giving a better and in depth understanding of the results.

4. Results

4.1 Quantitative analysis

Participant responses to the form emphasized the usefulness, features of an application, and availability of payment. Below are the results, together with the interpretations for the research conducted.

Participants' answers at question of whether an app that allows digitally organizing clothes and recommending outfits with AI would be useful are presented in Table no. 1:

Table 1: Interest in Using a Mobile Application for AI-Powered Outfit Suggestions

Answer	Frequency	Percentage
Yes, it would be very useful	46	45.1%
Maybe if it had advanced features	27	26.5%
Not sure	17	16.7%
No, I wouldn't use it	12	11.8%

Source: created by authors

Interpretation: 72% of respondents express direct or indirect interest in such an application confirming the potential among Generation Z. A small percentage of 11.8% express no interest. Thus, a significant openness towards the digitization of wardrobe and outfit recommendations can be observed.

The next issue tracked is the willingness to pay a price for the use of such an application and the answers are as shown in Table no. 2:

Table 2: Participant Opinions on Paying for a Mobile Wardrobe App

Answer	Frequency	Percentage
Depends on features and price	50	49.0%
No	38	37.3%
Yes	14	13.7%

Source: created by authors

Interpretation: The app is considered useful by a percentage of 20% of respondents. They are willing to pay for it, but the majority prefer the free version, even with less features. The percentage difference highlights the difficulties of monetization among young people.

As regarding the relation between dress behaviour and the outfit planning habits, the results are presented in Table no. 3:

Table 3: Clothing Behavior Related to "in-time" Outfit Preparation

Answer	Frequency	Percentage
Yes, always	43	42.2%
Only for special occasions	36	35.3%
Rarely	19	18.6%
No, never	4	3.9%

Source: created by authors

Interpretation: A significant percentage of respondents (42,2%) use to prepare their outfits in advance, while others do it at least for important events in their lives. Very few respondents choose their outfits spontaneously. This result converges to the idea that the desire for visualization and efficient organization provided by a mobile application might come to meet a real need. Another aspect evaluated was the motivation to use this type of application, the choices were multiple choice and the results are presented in Table no. 4:

Table 4: The reasons that influence the use of an application type „digital wardrobe”

Answer	Frequency	Percentage
Inspiration for new outfits	81	79.4%
Better organization of clothes	46	45.1%
Time-saving	45	44.1%

Source: created by authors

Interpretation: The respondents' responses exceed 100% being a multiple-choice question. A high percentage of respondents (79%) were interested in inspiration for new outfits, another choice with a significant percentage was better organization of clothes (45%) and with a small difference was time-saving (44%). The choice of a high percentage of all 3 options indicates the expectation of a complete solution. These results indicate that young people are attracted to solutions that can simplify everyday life.

In order to obtain a comprehensive study, in addition to the quantitative analysis, individual interviews were conducted to define the qualitative analysis.

4.2. Qualitative perspectives - recurring ideas from the interviews

For a deeper understanding of young people's attitudes and availability to adopt a dressing mobile app, six individual participants were interviewed, purposely selected for their diversity: gender, occupation, level of education and interest in fashion. The responses were reviewed exploratorily by noticing the main repetitive thoughts and

ideas. The most frequently mentioned expectations and needs we could retain might be synthesized as four main characteristics for the mobile app:

Simplicity of the app: respondents expressed a desire for an intuitive design, clean interface, easy-to-navigate menus, neutral colors, and essential functions. These demands are confirmed by existing research in the digital area where it is emphasized how important visual clarity and simplicity in the interface is for digital interaction (Hollebeek et al., 2024; Spence, 2011). From the User Experience (UX) area that summarizes the user experience and its reactions we find that are visually rich or functional applications are quickly abandoned by Generation Z. (Imschloss & Kuehn, 2017). Simulating outfits on an avatar: The desire to visualize clothes without the need for physical activity or clutter is seen as a useful function. The idea is supported by the extension of the concept of the digital self (Noto La Diega, 2018; Cheon et al., 2019), where technology is used to simulate and project style and identity in digital space. Time saved: respondents expressed their intention to reduce decision time and to receive outfit suggestions depending on the context: weather, activity, mood. These functions are embedded in fashion-tech and known as context-aware personalization (Travassos & Rosario, 2025; Marjeh et al., 2024). Sharing with friends: the "sharing" function is considered a "must have", especially between couples and friends, as it emphasizes the need for validation, coordination of receiving or feedback. Generation Z puts acceptance on collaboration, digital expressiveness and transparency (Seemiller & Grace, 2019; Reflecting on One's Extended Digital Self, 2020). From the interviews, the extracted ideas supplemented the results of the survey and brought to our attention the emotional side of young people and their way of behaving in relation to their clothes and technology. There is a need for balance between utility and expression of style, an important aspect for a successful application. The 4 essential points that resulted from the interviews: the simplicity of the application, the simulation of the outfits on an avatar, the time saved, the sharing with friends reflect the clear needs of combining the 2 domains: practical and affective. Respondents want an intuitive application, a simple interface and useful functions to help them optimize the routine of preparing outfits by defining the technical side, and the emotional side is fulfilled by the desire to share with friends indicating the need for human connection and validation. These expectations combine the needs of a profile that is looking for an efficient and lifestyle-appropriate mobile application. The results define functional and emotional expectations from the younger generation. Technically, these expectations can be met in a multiplatform application available on web and mobile, built with frameworks such as Flutter or React Native, which provides fluid interfaces. The items in the wardrobe will be displayed on a white canvas and with the drag and drop function will allow the user to create outfits easily and intuitively. Outfits created can be saved in the cloud database, providing quick access to saved data at any time. Finally, this study is not only conceptual with can provide design solutions and suggestions for using a programming language that can be adapted on several versions according to the behavior of the target audience.

5. Conclusions, implications and future directions

The present study aimed to understand how young people from generation Z perceive and use mobile applications for use and recommendation of outfits, focusing on both the technical and emotional perspective. Using the Technology Acceptance Model – TAM model (Davis, 1989) explaining the willingness of people to adopt a technology if they consider it useful and easy to use, research has integrated ideas from consumers' behavior theory to analyze the affective motivation of young people and how these tools are perceived. The results are of particular interest among young users, with an obvious appeal to digital tools that ease the process of choosing clothes and save time. However, there are considerable payment reluctances which can be a challenge for app developers. Expectations from such an application are clear: easy to use, intuitive and an avatar for simulating the outfits. The conclusions of this study consist of a starting point for developing an application based on the real expectations and needs of young users, requiring an approach that blends technology with emotion. Success in the fashion-tech field is closely related to the emotional and everyday context of young people. The practical utility of this research is valuable for mobile and web application developers in the context of understanding the needs of Generation Z audiences, a generation that has grown in the digital age and expects the technology to be intuitive, personalized and easy to integrate into everyday life (Seemiller & Grace, 2019). The limitations of this study consist in the small socio-demographic diversity of the sample chosen. A direct comparison between the preferences and tendencies described by active users of applications and the answers provided by non-users could have been useful for identifying new features required for this kind of mobile apps. Another limitation of the present research resides in the fact that the qualitative part was based on descriptive observations, lacking the application of systematic analysis techniques. A direction for further research could be the expansion of respondents from other geographical areas, interviewing people in the fashion field as well as interviewing mobile application developers. On the long run, it could be an analysis that would allow us to understand how user perceptions change in the long run, the analysis could represent a starting point that would allow us to understand how user perceptions change with constant use and how the emotional relationship and digital habits evolve.

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