SUPPORTING CORPORATE DECISION-MAKING WITH THE TABLEAU PROGRAM

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Abstract: *Decision making is a common activity for all of us. Often we find ourselves in a position to be among different options and alternatives choose. While related to our everyday actions decision situations contain few alternatives, belonging to our work, to business decisions are more complex and we need a considerable amount of information and knowledge to make a decision. The quality of our decision depends heavily on the accuracy of the knowledge and information available to us, which can range from exact knowledge to belief. The rapidly changing information technology environment assigns a significant and ever-increasing role to the information systems used by managers. In today 's economic environment, all kinds of help is useful for managers, which a they can be used in decision-making, whether long-term strategic or short-term operational these are decisions. The simplest way to support decision - making is to use the knowledge and skills in question concise presentation, presentation, summary and weighting of information. A higher level of decision support is the use of tools that make the relationships between the different components of the decision problem and the uncertain effects of the environment visible. For the operation of companies, the continuous development of decision support functions, the application of business intelligence (BI) tools, is a priority, since those facilitate the undertaking of management tasks as support instruments. All these methods are info-communication solutions, which are applicable to link and analyse data, obtained from various data sources of the company systems. These are reporting-oriented, focussing on decision support. In our study, we introduce an application of the latest Tableau software, supporting business intelligence, which is applicable at SME's and corporations as well. Within Hungary, we have created a system that provides assistance to entrepreneurs in the border region of Hajdú-Bihar County, with the help of which they can examine the performance of their business in a benchmark-like way, on the other hand by changing certain input parameters of the model - e.g. by achieving the planned future performances - it is possible to show what kind of development and change they can achieve in the given business environment.*

Keywords: *Tableau softver; Business Intelligence; Decision Making; SME; Hungary.*

JEL Classification: *M15.*

1. Introduction

In the 1980's decision support systems were particularly able to provide support in decisions related to clearly specified problems, mostly as targeted applications (e.g. analysis of company accounts in the financial sector, or supplier analysis in commerce) (POWER 2002). Due to the progress in technology, the system expanded: on the one hand, text-, database-, table-, equation- and rule-based, on the other hand communication-, data-, document-, knowledge-, web- and model controlled decision support solutions emerged. Over time this distinction disappeared. Complexity increased many times over, and in the same time it was indispensable that relational databases, Online Analytical Processing (OLAP), data warehouse technologies and data mining appeared (LINSTEDT ET AL, 2008). Today's decision support systems are really multi-purpose, and applicable to solve diversified problems (HAMMERGEN – SIMON, 2009).

Business Intelligence became a commonly known phrase in the early 1990's, because the advertising professionals felt this expression is better marketable than the Decision Support System that had been used until then. There is no practical borderline between the two expressions, though. In his definition, Loshin highlighted that the expression Business Intelligence is not exclusively equal to the information systems, since it also includes the conversion of necessary processes, technologies and tools into information, the conversion of information into knowledge, and finally the conversion of knowledge into plans (LOSHIN, 2003). These processes are the drivers of profitable business activities. In addition it includes the data warehouses, business analysis tools and knowledge management. In conclusion, business intelligence is not only a collection of IT solutions, but a complex concept, a set of instruments strengthening the decision support function of the company. It concentrates the existing data of the organisation in a data warehouse, which provides for the preparation of statements, reports, and exploration of previously unknown relations by connecting data (HOWSON, 2007).

Business Intelligence systems can be used in various areas, including but not limited to:

- Preparation of reports, statements and records.
- Visualisation of executive dashboards.
- Definition of indicators, key performance indicators (KPI), monitoring of the critical values.
- Undertaking of business and financial analysis tasks.
- Tasks related to planning and modelling.
- Analysis and comparison of expected and actual data, investigation of the reasons for the deviations.
- Consolidation, roll-up of data, run time series analyses.
- Implementation of data visualisation solutions (Kővári, 2007).

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Tableau is a BI instrument, which offers a highly interactive and intuitive visual-based exploration experience for business users. Provides analytic to easily access, prepare and analyse their data without the need for coding. Advantages include (ROZMIS, 2017):

- Fulfils strict security requirements of the clients even in the financial, government and healthcare sectors.
- It can provide accessible solutions for smaller companies, while can also serve the tens of thousands of users of a corporation.
- Maintains a direct contact with most of the data sources, and communicates: Results are accessible for everyone, can be flexibly edited by whatever means (mobile applications available for IOS and Android).
- User-friendly environment, since analytic becomes feeling of exploration. See and understand data!
- Simple and flexible filtering, managed analysis options, collation of data, association of data.
- Requires minimal IT resources

To compare the companies we can choose form lots of aspects, but we have to keen for the best based structure of the financial indicators, what can show the real performance of the companies. Fenyves et al (2019) based their analisys for four financial indicators for benchmarking of the pharmaceutical companies on international level.

2. Methodology

One of the objectives of the ROHU 217 project – what supported this paper - is that – according to the previously introduced general decision support, business intelligence methods – it should provide useful information for the managers in the decision-making process. In frame of the ROHU 217 project we needed to develop such an application what can support the decision making process of the companies compared this with another firms, according the following conditions:
The software will be used for:
a. Processing company databases in an efficient and operational manner to substantiate financial decisions;
b. Realization of managerial scoreboards with the main performance indicators of the companies;
c. Monitoring the dynamics of company performance indicators and establishing their financial diagnosis based on the selected indicators;
d. Establishing mechanism for risk control and risk warning for company business management;
So the software can be used by staff of the University in instructing business owners, financial managers or other interested parties in the financial decision making process. In the same time, in the future, all other interesting parties can use this software for their financial decision making process, as the software will be available inside the University.

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In the same time, the model also serves the activities of the ROHU 217 project, whereby we provide assistance in the use of the business intelligence support software. The application shown in the study, can be exploited jointly by the company stakeholders in the development of well-founded financial decisions of the company. Accordingly, a model has been developed for the business intelligence-like utilisation of the Tableau software at the Faculty of Economics and Business of the University of Debrecen, which is applicable for providing assistance to the entrepreneurs of the border region, so that they can conduct a benchmark-like performance review of their respective companies. By changing certain input parameters – for example, by reaching planned future performances – the model can also reveal their potential development in the given entrepreneurial environment.

To achieve this objective, the circle of undertakings, involved in the survey, has been defined, which in our case are the small and medium-sized agricultural production companies of Hajdú-Bihar County, with their respective financial statement data, originating from the EMIS database. The SME's have been filtered from the database, based on the EU criteria, for their net sales being between 2 and 50 million EUR. In order to get the largest possible number of businesses included in the comparison, no further filtering was set up for the number of employees or balance sheet total.

Setting the balance sheet total between 2 and 47 million EUR, and number of employees between 10 and 249, would have only caused minimal differences in the number of enterprises included in the survey.

From the EMIS database, data of the companies was exported to Excel worksheets, where we started by data cleansing for the indicators with no value, using the built-in Power Query extension of Excel.

In the second step, we deleted the companies, which did not have sufficient data filled, compared to the rest of the companies, since they would have not provided a correct base for comparison.

Then, based on the data of companies, the scorecard of Table 1, was compiled.

Table 1: The range of indices formed

Indicators	Calculation
Profitability situation	
Operating ROA	EBIT/ Average Total Assets
ROA	Net Income, divided by Average Total Assets
ROE	Net Income, divided by Shareholders' Equity
ROS	Operating Profit, divided by Net Sales
Gross Profit Margin	(Net Sales Revenue – Cost of Goods Sold) /Net Sales Revenue
Financial situation	
Current Ratio	Current Assets, divided by Current Liabilities
Quick Ratio	Current Assets minus Inventory, divided by Current Liabilities
Debt Ratio	Total Debt, divided by Total Assets
Other indicators	

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Indicators	Calculation
Rate of Tax Payable, compared to Sales	Tax Liability, divided by Net Sales Revenue
Turnover Rate of Customers	Net sales revenue, divided by Trade Receivable
Average Turnover Time of Customers	365 days, divided by Turnover Rate of Customers

Source: own result

In compiling the indicators that best qualify the results of the activity, we took into account several relevant literature. In the study of Bayaraa, Tarnóczi and Fenyves (2019), companies are clustered on the basis of performance indicators and compared on the basis of their financial indicators.

In the third step of the preparation, we extend the cleaned EMIS dataset based on the measures in Table 1 and unpivot the measures {Number of Employees, Assets, Current Assets, etc..} to {Indicator, Value}.

Before using the graphical analysis applications, provided by the Tableau software, data of the company, initiating the comparison, have to be recorded in the Excel data source, transformed to the data of the companies involved in benchmarking.

In the first step, year of the source data of the company, has to be selected from the drop-down menu:
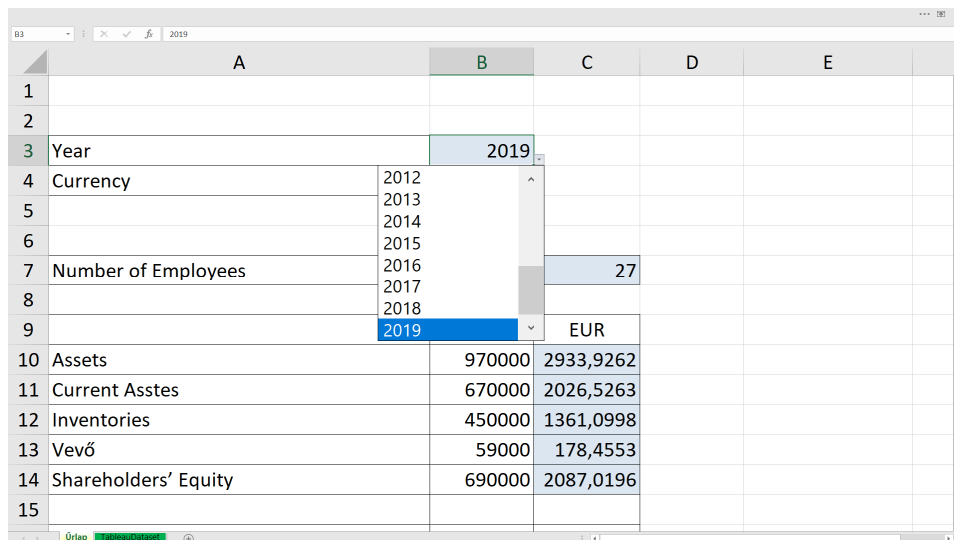

Figure 1: Selection of source data period for company data
Source: own

By selecting the year, data of the company, initiating the comparison, are corrected by the value of the national consumer price index, for the years 2015-2018, providing

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comparability with the 2015-2018 values of companies, downloaded from the EMIS database.

In the second step, currency for the financial data of the company, initiating the comparison, has to be selected. In conjunction with the ROHU217 project, three currencies have been recorded: Euro, RON and HUF. (Figure 2)

The financial data provided in HUF and RON are converted to EUR, using the latest exchange rates of the Hungarian National Bank, since the benchmark company base data were collected in EUR, and the indices were calculated in EUR.

In subsequent steps, the employment, financial and revenue data of the company to be compared, are recorded in the MS Excel worksheet. Figure 2.

	A	B	C
7	Number of Employees	27	27
9		HUF	EUR
10	Assets	970000	2933,926
11	Current Asstes	670000	2026,526
12	Inventories	450000	1361,1
13	Vevő	59000	178,4553
14	Shareholders' Equity	690000	2087,02
17	Total Debt	280000	846,9065
18	Current Liabilities	130000	393,2066
21	Net Sales Revenues	790000	2389,486
22	Cost of Good Sold (CoGS)	360000	1088,88
23	Operating Income	798000	2413,684
24	Earnings before Interest and Taxes (EBIT)	49000	148,2086
25	Earnings before Taxes	47000	142,1593
26	Tax	3200	9,678932
29	Update		

Figure 2: Recording options of financial data of the company
Source: own

Using the Update function, the recorded data are transformed to the database, and they become comparable with the enterprises of similar size and pursuing similar activities of Hajdú-Bihar County.

In the last step of preparation we union the EMIS dataset with the recorded and extended (with calculated measures) data of the own company, mark the measures with i-indexable or n-not indexable, extend the unioned dataset with the indexed measures and calculate the category for number of employees.

The saved MS Excel file will be the input data source of the Tableau program (in this case the 'TableauDataset' worksheet in the Agro_ds.xlsm file), which facilitate the comparative analysis in the Tableau program, using different conditions (Figure 3).
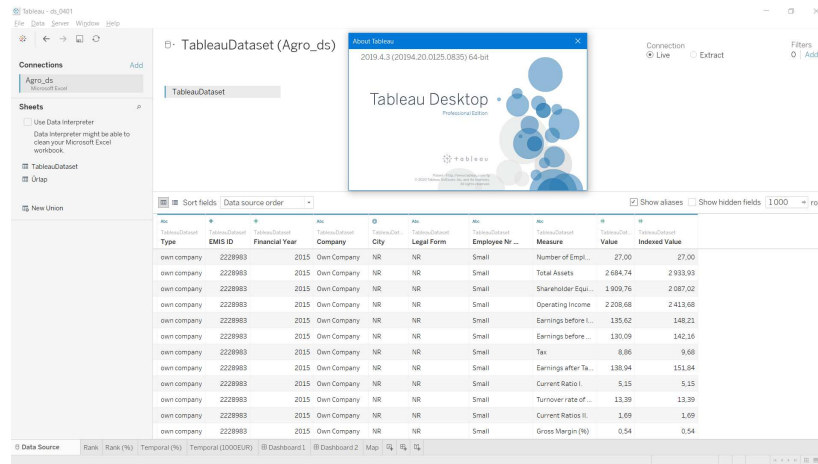
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Figure 3: Connection between Tableau and the database (Agro_ds.xlsx)
Source: own

3. Results

The company to be compared, is marked "o" (= own), while the rest of the companies indexed in the database and having averaged values, are marked "c" (= comparison).
The basis for ranking the "own" company, is the comparison with the indexed and averaged database, introduced above. The own company (marked with orange in the figures) is ranked by selecting the desired indicator – or by comparison with the pool of the indicators in the first instance (Figures 4-5-6).
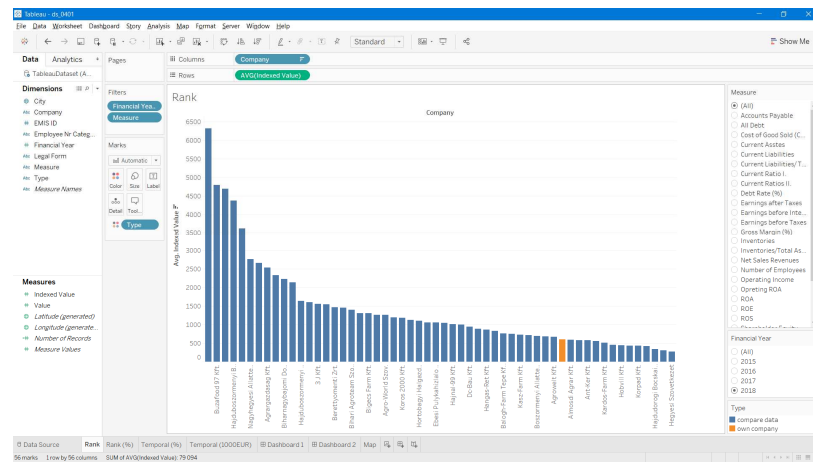
Figure 4: Position of the own company, compared to the pool of averaged indices of the companies in the database (All), indexed for the year 2018
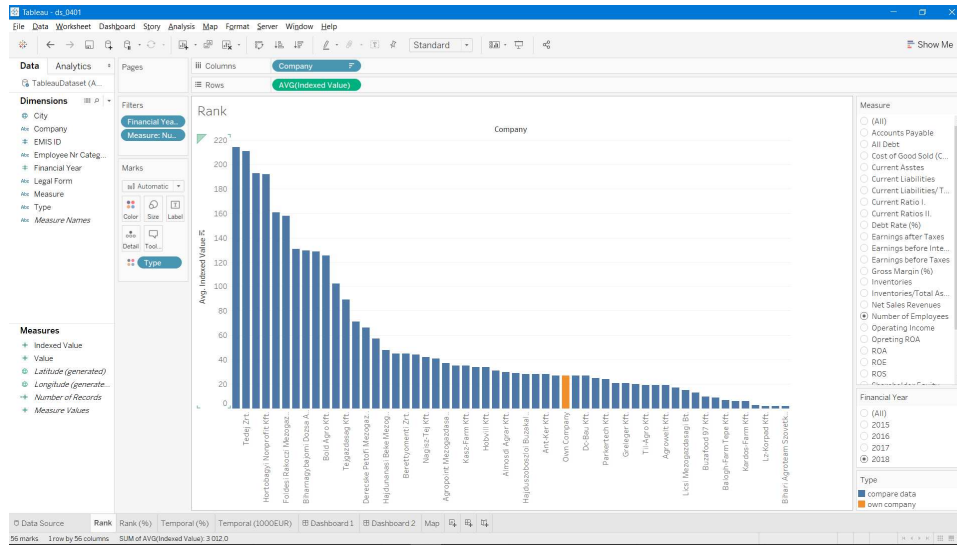Source: own

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Figure 5: Comparison of the number of employees of the own company with the database companies' values for 2018.
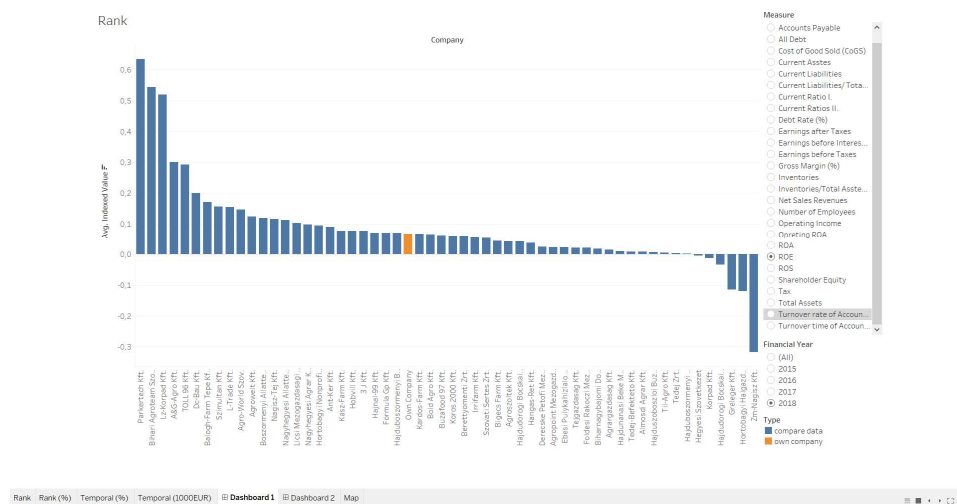Source: own

Figure 6: Comparison of the ROE indicator of the own company with the database companies' values for 2018.
Source: own

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Figure 6 is the dashboard-type display of Tableau, where the parameters irrelevant from the user's perspective, are not shown, only the information relevant for the comparison, are visible.

The database also has the option to compare the own company by size categories, broken down to business years, by selecting different indicators (Figures 7-8).
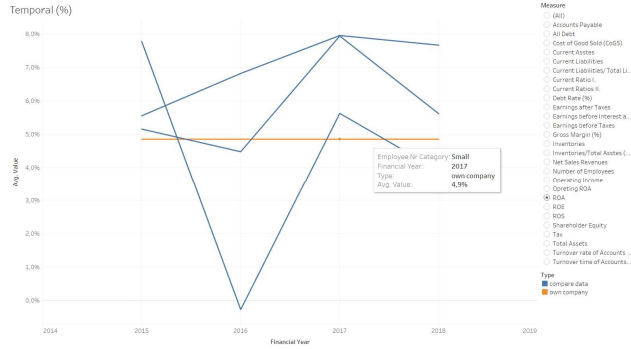

Figure 7: Average ROA value of the own company, compared to the yearly average ROA value of the micro and medium-sized companies.
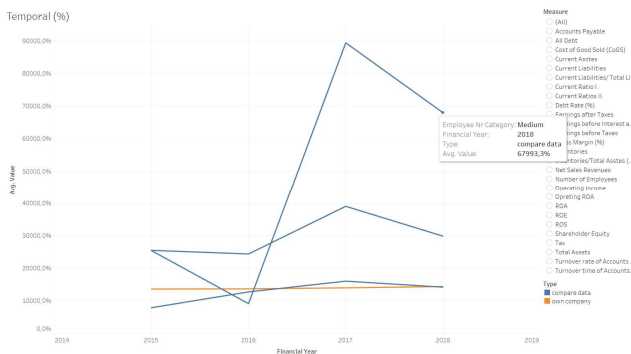Source: own

Figure 8: Average EBIT value of the own company, compared to the yearly average EBIT value of the micro and medium-sized companies.
Source: own

There is also a map-based comparison option in the Tableau program, where the community-level average indicator values can be compared with the data of the own company, even filtered by business year (Figure 9).
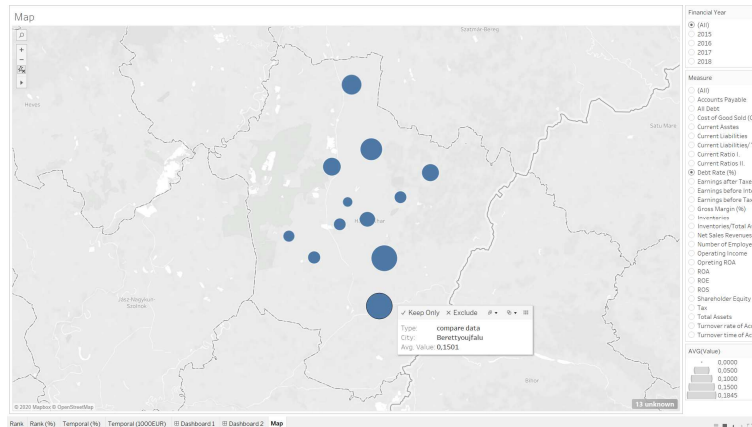
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Figure 9: Debt ratio of the own company, compared to the average values of the database companies, for the years 2015 through 2018
Source: own

The developed model enables the decision makers of enterprises to receive a benchmark-type comparison by providing assets, finances and earnings data of their respective companies. In our case this is provided within an area (Hajdú-Bihar County) and within a business field (agricultural production), using 28 company indicators.
The database of the model can be extended both by area and business sector, thus a more complex comparison opportunity can be offered for the indicators representing company performance.
Because of the different currencies and indexing by the changing consumer price index, different periods and companies from different countries, can be compared in the model, which provides even further useful information for the managers.

4. Summary

Careful organisation of data acquisition, storage of the enormous amount of data, and ensuring that the data is workable, is a key challenge for every company. The complex business intelligence systems provide a whole range of possibilities (mostly covering all related processes of companies), which all contribute to enhancing the performance of businesses. This is the result of data being available at all times, and reports prepared, using different analysis techniques, being attainable. Thereby the persons responsible for decision making, should be able to draw conclusions quickly and efficiently, and thus shaping correct solutions. By so doing, the leaders and managers can spend more time on the implementation and supervision of these solutions, ensuring the projects are executed properly.

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5. Acknowledgements

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