

CONSUMER ATTITUDES TOWARD ARTIFICIAL INTELLIGENCE: A COMPARATIVE ANALYSIS OF MEASUREMENT SCALES

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Abstract: *The economic significance of artificial intelligence (AI) is rapidly increasing, influencing industries, employment, and consumer behaviour all around the globe. As AI applications become increasingly apparent and tangible in our daily lives, understanding consumer attitudes toward AI has become essential for businesses and policymakers aiming to drive adoption and trust in such technologies. This paper firstly explores the economic relevance of AI by highlighting its impact on various fields and its role in driving economic growth. A critical aspect of harnessing the full economic potential of AI lies in the accurate measurement of consumer attitudes, as public perception influences the adoption of technology, hence its final market success. Accurate insights into public attitudes are also key to shaping policies that ensure ethical AI integration, fostering a balanced approach between innovation and societal concerns. Beyond adoption, understanding attitudes helps identify potential barriers which could hinder the widespread acceptance of AI systems. This paper then proceeds to providing a critical overview of the different scales developed for assessing consumer attitudes towards AI. These scales have been established in varied contexts, from evaluating general perceptions to measuring attitudes toward specific AI applications. The review underscores the importance of ensuring adaptability and context-specific relevance when selecting or designing these tools. Comparisons between scales reveal distinct advantages and disadvantages in relation to reliability, robustness, contextual limitations or scope. Finally, this paper aims to provide perspectives for selecting the right AI attitude scale, emphasizing different methodological considerations. These insights aim to guide researchers and practitioners in effectively measuring consumer attitudes, contributing to more informed decisions in AI based innovative processes.*

Keywords: artificial intelligence; attitude; scale development; consumer behaviour

JEL classification: C10; D11; O33

1. General Introduction

Artificial intelligence (AI) is a field of computer science that focuses on developing systems capable of performing tasks that would normally require human intelligence, like learning, reasoning, problem-solving, perception, and language comprehension (Lexcellent, 2019; Zhang et al., 2021).

The popularity of the technology has experienced significant fluctuations since its early introduction in the 1950s (Grabowski, 2024). However, it seems that in the last decade AI is gaining consequential public and academic interest, mostly fuelled by the emergence of generative AI (Duan, Edwards and Dwivedi, 2019).

1.1. *Economic Relevance of AI*

The economic relevance of artificial intelligence is versatile and fundamental as it levies an immense impact on different aspects of economic growth and development by enhancing productivity and operational efficiency (Lukianenko and Simakhova, 2024), promoting significant transformations in various industries and their traditional structures (Wang et al., 2024), and shifting the balance of global economic power, allowing new markets to exceed developed ones (Yu and Carroll, 2023). AI drives economic growth through several mechanisms, which include intelligent penetration of various sectors and boundary extension, knowledge creation and self-enhancement, as well as technological innovation efficiency improvement (Zuo, 2023). Nevertheless, from the point of society and consumers, the fact that AI is reshaping the labour market, parallelly taking and creating jobs, can be of the highest importance (Lukianenko and Simakhova, 2024).

1.2. *Attitudes Towards AI*

Understanding and quantifying consumer attitudes towards AI is critical for several reasons. First, consumer attitudes towards AI significantly impact their purchase intentions, as well as their acceptance of technology, which in the end affects general market success (Piskóti, Nagy and Molnár, 2013; Liang, Lee and Workman, 2020). Measuring attitude also allows us to understand the different dimensions and layers of consumer behaviour, their decisions and motivations, not to mention addressing cultural and personality-related differences or certain ethical issues (Bartha and Molnár, 2016; Park, Woo and Kim, 2024).

2. *AI Attitude Scales and their Critical Evaluation*

To measure consumer attitudes towards AI, several scales have been developed and proposed by researchers. These all provide a comprehensive tool for assessing different dimensions of attitude. Each scale has their own strengths and weaknesses, which is detailed in the followings, along with a short description of their general approach.

2.1. *Artificial Intelligence Attitude Scale (AIAS-4)*

The Artificial Intelligence Attitude Scale (AIAS-4) is a self-assessment construct designed by Grassini (2023) to evaluate consumers' perceptions of AI and related technologies. Being a concise instrument, the scale only consists of four items that identifies individuals' beliefs about AI's influence on their everyday lives, careers and society as a whole. The scale builds upon existing theoretical constructs like the TAM model (Davis, 1986) and UTAUT framework (Venkatesh et al., 2003), hence

capturing individual views about AI relating to perceived utility, potential societal impact and behavioural intention to use.

The final version of AIAS-4 is a four-item unidimensional scale measuring a single construct related to attitude towards AI. The previous version of the scale included a fifth item focusing on perceived threats posed by the technology, however after primer validations, the results showed the need for omitting the item to improve internal consistency and validity. Regarding scale validation, the scale has been tested through CFA and EFA, with results proving high internal consistency and structural validity across diverse populations (Grassini, 2023).

Regarding the strengths of the scale, we shall mention its concise nature and being a robust tool for assessing general AI-related consumer attitudes. The scale can be easily adapted to various contexts, making it appropriate for a great array evaluative purpose. Its brevity and clarity enhance usability in large-scale surveys. Furthermore, the AIAS-4 scale has been proved to be statistically robust, its high internal consistency and validity make it a reliable tool for broad measures of overall sentiment.

As for the limitations, we shall highlight that the four-item construct does not allow a very diversified understanding of individual attitude, rather a snapshot of a general sentiment. Furthermore, there is a certain ambiguity in the theoretical basis of the scale. While rooted in the TAM and UTAUT models, the scale does not respect their constructs, causing a confusion of relationships. This is reflected in the fact that behavioural intention is treated as part of the general attitude construct (i.e. the single dimension the scale assesses), which contradicts the established causal models of the TAM and UTAUT that treats attitude (independent variable) as an influencing factor of behavioural intention (dependent outcome variable). However, the magnitude of this issue weakens if we take into account the strong statistical relevance and proved internal consistency and validity. In other words, this theoretical conflict matters most when using the scale for causal or predictive modelling. If the research purpose is purely descriptive, aiming to assess an overall attitude toward AI, this limitation may have less impact.

2.2. General Attitude towards Artificial Intelligence Scale (GAAIS)

Among the general AI attitude assessment tools, the GAAIS can be considered to be the most sophisticated approach, providing a two-dimensional perspective on consumers' overall sentiment. This dimensionality reflects in the establishment of two subscales, i.e. the positive subscale, capturing societal and personal utility and a negative subscale, reflecting concerns and discomforts associated with AI. The scale (developed by Schepman and Rodway, 2020, 2023) proves to be a powerful psychometric tool, appropriate for measuring individuals' general attitudes towards AI. Scale validations (including EFA and CFA) show good indices, demonstrating good psychometric properties and validity. The scale has already been utilized and validated in multiple languages and contexts, including Turkish and Korean versions, confirming good reliability and validity (Seo and Ahn, 2022; Kaya et al., 2024).

One of the major strengths of the scale is that it provides a more versatile approach to the assessment of individual AI attitude. This versatility is supported by the two-factor structure (distinguishing between positive and negative attitudes towards AI, which helps capturing a broad spectrum of emotions or potential concerns

(Schepman and Rodway, 2020). Additionally, the proven psychometric (convergent and discriminant) validity of the scale underscores its reliability in measuring general AI perceptions (Schepman and Rodway, 2023). Finally, the GAAIS scale has been proved to be adaptable to various cross-cultural contexts, showing generalisability and validity across different focus areas (Kaya et al., 2024).

Regarding the limitations of the construct, the general approach to attitude assessment shall be highlighted. As GAAIS is effective in capturing general sentiments, it may not address nuanced perceptions related to specific AI applications. Additionally, some research raise the awareness about the effect of demographic variability, meaning that the scale's effectiveness could vary among different demographic groups, such as age and professional background, which may require additional contextual adjustments of the original GAAIS scale (Özçevik Subaşı et al., 2024; Yalcinkaya, Ergin and Yucel, 2024). As for its relation with established theoretical constructs we can identify the same conflict as with AIAS-4, as statement related to behavioural intention are also integrated to the attitude assessment tool.

2.3. Measurement of Attitude in Language Learning with AI (MALL:AI)

MALL:AI is a specialized, validated tool created to assess language learners' attitudes towards artificial intelligence and its integration in their learning process. This specialized scale constitutes of three sub-factors, focusing on the assessment of AI-aided communicative, behavioural and cognitive skill development. The scale was constructed by Yildiz (2023), with the aim of creating a scale that is specifically tailored to the context of language learning, making it more relevant for measuring attitude in this particular domain. The scale was tested and validated and has been shown to be able accurately measure consumer attitudes towards AI in language learning.

When it comes to the strong points of the scale, we need to highlight its specificity to a certain educational context. Unlike other scale, MALL:AI is exclusively dedicated to the assessment of students' attitudes towards AI application in the language learning process, making it more relevant to explore this exact objective. Regarding statistical accuracy, the scale proved to be reliable, ensuring that it accurately measures what it is intended to. Furthermore, the three-perspective approach provides a holistic view of language learners' attitudes towards AI.

The majority of its potential setbacks are related to its context of development. One aspect is the probability of bias, as the participants included in the study were already advanced in the use of digital educational tools, their positive attitudes might not be generalisable for the whole population. The limited demographic scope of the study supports this objection too. As the study primarily involved university students from Turkey, the generalisability of the research findings to other cultures or demographic groups can be questioned.

Another limitation can be the lack of longitudinal data, as the research related to the scale development does not provide long-term data on how attitudes might change over time, during the course of continued AI use in their language learning processes (Yildiz, 2023).

2.4. Attitude Toward AI in Defense (AAID)

Similarly to the previous scale, Attitude Toward AI in Defense (AAID) is also a newly developed measurement tool. Furthermore, AAID is also a rather specific scale too, as it was designed to assess public attitudes towards the use of AI in defensive contexts. The scale developed by Hadlington et al. (2023) was validated on a large sample (n=1590) with diverse demographic characteristics. The item pool originally consisted of 29 attitudinal statements, which were later reduced to 15 items following an exploratory factor analysis. The final scale consists of two factors, one reflecting positive outcomes (anticipated benefits of implementing AI in defence) and the other negative outcomes (focusing on the adverse consequences of AI used in a military context). The importance of the scale lies in the fact that it helps understanding public attitudes toward AI in defense which is essential to ensure that its development and implementation aligns with societal values and garner public support. Public acceptance is a critical factor in legitimizing AI's use in any field, as societal endorsement can influence policy and funding decisions. Additionally, identifying concerns and barriers through targeted measures provides valuable insights into potential challenges, enabling policymakers and developers to address public reservations effectively.

The major strength of the scale lies in its specificity, as it provides a through insight to a very explicit domain. Furthermore, the statistical validation of the scale showed sufficient consistency and reliability.

However, in some research contexts the use of this scale can be rather restrictive, as it is not able to address AI-related attitudinal components outside this exact field, resulting in issues with generalisability.

2.5. Attitudes towards artificial intelligence at work (AAAW)

Developed by Park et al. (2024) the Attitude Towards Artificial Intelligence at Work (AAAW) scale is a rather robust construct, depicting a broad perspective of attitudes towards AI at workplace. The AAAW centres around six dimensions, these are perceived human likeness, perceived adaptability, perceived quality of AI, AI use anxiety, job insecurity and personal utility.

The AAAW scale can be considered to be a comprehensive and valid tool for measuring attitudes related to AI use in professional settings, providing valuable insights for the successful integration of AI in organisational environments. Additionally, the AAAW has undergone established validation, as it has been tested on three independent samples 2841 participants in total, demonstrating good psychometric properties. Finally, the AAAW has been proven to be a reliable tool for forecasting important outcomes related to recruitment and employee integration of AI technologies as.

As for the limitations of the scale, the complexity of the construct can be considered to be a setback, as the measure is overly detailed for assessing general attitudes toward AI, instead it is more suited for evaluating workplace-specific contexts.

Table 1: Critical Evaluation of Different AI Attitude Scales

Scale	Description	Strengths	Limitations	Reference
AIAS-4	It is a refined 4-item scale focusing on perceived utility and societal impact.	Concise, easy to administer. Good internal consistency and structural validity.	Provides narrow insights. Contradicts previous theoretical findings.	Grassini, 2023
GAAIS	The scale has positive and negative subscales, capturing emotions and utility against concerns.	Its structure captures a broad range of attitudes. Good convergent and divergent validity.	Too general for specific applications. Theoretical ambiguity. Possible issues with generalisability.	Schepman and Rodway, 2023
MALL:AI	It is a scale developed for the measurement of language learners' attitudes towards the integration of AI to the learning process.	Specifically designed, capturing relevant skills. Valid and reliable for educational contexts.	Limited to educational contexts, not generalizable.	Yildiz, 2023
AAID	It is a specific scale, developed to measure public acceptance of AI in defense contexts.	Specific for defense contexts, captures positive and negative attitudes. Good internal reliability and validity.	Limited application, generalizability issues.	Hadlington et al., 2023
AAAW	This scale measures the personal perception of the integration of AI in their workplace	Comprehensive, covers 6 dimensions. Good psychometric properties.	Too detailed for general attitude assessment, more suited for workplace contexts.	Park, Woo and Kim, 2024

Source: edited by the author

It is important to note that apart from the above detailed scales there are some other alternatives for the measurement of AI attitudes. When selecting an AI attitude scale,

researchers shall take into account several factors like dimensionality or contextual relevance (Schepman and Rodway, 2023; Yildiz, 2023).

3. Suggestions for Future Research

When selecting an AI attitude scale, researchers must carefully consider several factors that are crucial in ensuring the scale's effectiveness and reliability. First, psychometric properties are paramount, requiring strong internal consistency and demonstrated validity (Grassini, 2023; Schepman and Rodway, 2023). Furthermore, the dimensionality of the construct is important too. Researchers must decide upon unidimensional scales, like the AIAS-4, or multidimensional scales such the AAAW (Park, Woo and Kim, 2024). It is important to evaluate the generality or the specificity of the research topic and choose an appropriate scale accordingly (Schepman and Rodway, 2023). Additionally, context and application play a significant role too, requiring a careful consideration of the target population and cultural relevance (Yildiz, 2023; Derinalp and Ozyurt, 2024). Finally, it is important to provide a comprehensive coverage of emotional and functional aspects of AI-related consumer attitudes (Park, Woo and Kim, 2024).

4. Conclusion

As AI is becoming more significant in today's world, it is important to explicitly assess consumers relating attitudes. There is a wide variety of available AI attitude scales, whose critical evaluation was presented in this paper. A careful consideration of choice is advised for future research, with specific regard to dimensionality and contexts.

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