Received Date: 20 April 2025 I Accepted Date: 23 June 2025

RESEARCH ARTICLE

OPUS Journal of Society Research

Artificial Intelligence Awareness Scale Development Study

Şükrü Mustafa Kaya[1], Vildan Bayram[2]

[1] Asst. Prof. Dr., Istanbul Aydin University, Department of Computer Technologies, İstanbul/Türkiye
ORCID: 0000-0003-2710-0063
E-Mail: mustafakaya@aydin.edu.tr

[2] Asst. Prof. Dr, Istanbul Aydin University, ABMYO, Business Administration Program, İstanbul/Türkiye
ORCID: 0000-0001-7526-6485
E-Mail: vildanbayram@aydin.edu.tr

Corresponding Author:
Şükrü Mustafa Kaya

July 2025
Volume:22
Issue:4
DOI: 10.26466/opusjsr.1680531

Citation:
Kaya, Ş.M. & Bayram, V. (2025). Artificial intelligence awareness scale development study. *OPUS– Journal of Society Research*, *22*(4), 657-672.

Abstract

The aim of the study is to develop a valid and reliable measurement tool to measure employees' perceptions of artificial intelligence awareness. In the first stage of the three-stage scale development study, in-depth interviews were conducted. As a result of the content analysis of the data obtained from the interviews, a 41-item proposition pool was created. In the second stage, a draft of the items was created and the scale was structured by consulting expert opinions in order to ensure meaning, face and scope validity. In the last stage, the scale was evaluated and a 14-item draft scale was created. As a result of the pilot application conducted on 132 employees working in the healthcare sector using the draft scale, it was decided to remove one item from the scale. Then, the final scale consisting of 13 items was reached: 139 employees in the automotive sector and 152 employees in the logistics sector. As a result of the analysis, a 13-item one-dimensional scale emerged. The CFA server determined that the scale provided an acceptable level of fit. Cronbach's Alpha values were 0.834 in the healthcare sector; It was calculated as 0.810 in the automotive sector and 0.867 in the logistics sector, and the scale was found to be valid and reliable. The scale is an important measurement tool to be used to analyze individuals' awareness of AI in measuring the level of individual awareness, determining educational needs, conducting attitude analysis, developing policies and strategies, and academic research.

Keywords: *Artificial Intelligence, Artificial Intelligence Perception, Artificial Intelligence Awareness, Scale Development, Scale*

Öz

Bu çalışmada, çalışanların yapay zekâ farkındalığına ilişkin algılarını ölçmek üzere geçerli ve güvenilir bir ölçüm aracı geliştirmek amaçlanmıştır. Üç aşamalı ölçek geliştirme çalışmasının ilk aşamasında derinlemesine görüşmeler yapılmıştır. Bu görüşmelerden elde edilen verilerin içerik analizi sonucunda 41 maddelik önerme havuzu oluşturulmuştur. İkinci aşamada maddelerin taslağı oluşturulmuş ve anlam, görünüş ve kapsam geçerliliğini sağlamak amacıyla uzman görüşlerine başvurularak ölçek yapılandırılmıştır. Son aşamada ölçek değerlendirilmiş ve 14 maddelik taslak ölçek oluşturulmuştur. Taslak ölçek kullanılarak sağlık sektöründe çalışan 132 çalışan üzerinde yapılan pilot uygulama sonucunda ölçekten bir maddenin çıkarılmasına karar verilmiştir. Daha sonra 13 maddeden oluşan nihai ölçeğe ulaşılmıştır: Otomotiv sektöründe 139 çalışan ve lojistik sektöründe 152 çalışan. Yapılan analizler sonucunda 13 maddelik tek boyutlu bir ölçek ortaya çıkmıştır. CFA sunucusu ölçeğin kabul edilebilir düzeyde uyum sağladığını belirlemiştir. Cronbach's Alpha değerleri sağlık sektöründe 0,834; otomotiv sektöründe 0,810 ve lojistik sektöründe 0,867 olarak hesaplanmış olup ölçeğin geçerli ve güvenilir olduğu bulunmuştur. Ölçek, bireysel farkındalık düzeyinin ölçülmesinde, eğitim ihtiyaçlarının belirlenmesinde, tutum analizlerinin yapılmasında, politika ve stratejiler geliştirilmesinde, akademik araştırmalarda bireylerin yapay zekaya ilişkin farkındalıklarının analiz edilmesinde kullanılabilecek önemli bir ölçüm aracıdır.

Anahtar Kelimeler: *Yapay Zekâ, Yapay Zekâ Algısı, Yapay Zekâ Farkındalığı Ölçek Geliştirme, Ölçek*

Introduction

Today, artificial intelligence (AI) technologies have become an essential component of digital transformation and have begun to make their presence felt across a broad spectrum—from daily life to the business world, from healthcare to education (Awad et al., 2020). The rapidly increasing influence of AI has created a critical need for awareness regarding how individuals and institutions perceive AI technologies, and to what extent they recognize the opportunities and risks associated with them (West et al., 2020). AI awareness not only facilitates a conscious evaluation of the innovations brought by AI but also contributes to a better understanding of its ethical, security-related, and workforce-related impacts (Floridi et al., 2020).

AI awareness is a broad concept that encompasses individuals' knowledge, perceptions, and attitudes toward AI technologies. Measuring this awareness is important for understanding individuals' levels of knowledge about AI, their attitudes toward these technologies, and their awareness of potential risks (Cath et al., 2018). The aim of this study is to develop a valid and reliable scale to measure individuals' levels of AI awareness. The scale development process was designed in light of existing studies in the literature on AI awareness and the societal impacts of AI (Bostrom et al., 2021).

Measuring AI awareness is also crucial for developing strategies to increase public knowledge about these technologies and to minimize their potential negative effects (Jobin et al., 2020). In this context, the AI Awareness Scale to be developed is expected to serve as a significant tool in both academic research and practical applications. The scale can be used to evaluate the effectiveness of educational programs aimed at increasing awareness of AI technologies and to determine the approaches of individuals and institutions toward these technologies (Müller, 2020; Tegmark, 2021).

Conceptual Framework

This section addresses the concepts related to the topic of the scale, particularly artificial intelligence and its applications.

Artificial Intelligence

In 1950, British mathematician Alan Turing proposed an experiment known as the Turing Test in his article "Computing Machinery and Intelligence." This test was designed to determine whether a computer could think like a human (Russell et al., 2021). In 1956, researchers such as John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon gathered at Dartmouth College and laid the foundations of AI research (LeCun et al., 2021). During the 1970s and 1980s, an approach known as expert systems was developed in the field of AI. These systems were designed to transfer the knowledge of human experts into computer programs and were used in decision-making processes. Throughout the 1980s and 1990s, research in AI focused heavily on machine learning, which aims to enhance the ability of computers to learn from data. Significant algorithms and techniques were developed during this period (Haenlein et al., 2019).

In its broadest definition, artificial intelligence refers to a computer or a computer-controlled machine's ability to perform tasks that are typically associated with high-level mental processes such as reasoning, inference, generalization, and learning from past experiences (Nabiyev, 2016). The term "Artificial Intelligence," coined in 1955 by retired Stanford professor John McCarthy, was defined by him as the science and engineering of making intelligent machines (Youdong et al., 2014). AI is a branch of computer science and involves developing computer programs to perform tasks that would otherwise require human intelligence. AI algorithms tackle and provide solutions to problems involving learning, perception, problem-solving, language understanding, and logical reasoning (Saleh, 2019).

Since the primary goal of AI research is to develop systems that can think and make decisions like humans, the structure and functioning of the biological brain have served as inspiration for researchers in this field (Marcus, 2019). One of the foundational developments in AI, inspired by biological neurons (nerve cells), was the McCulloch-Pitts neuron, proposed in 1943 by Warren S. McCulloch and Walter Pitts (Hassabis et al., 2020).

This model represents a simple binary variable that can be in an "on" or "off" state and is capable of performing basic logical functions such as AND, OR, and NOT (Kartal, 2021).

AI is an integration of computer science and physiology. In simple terms, intelligence is the computational part of the ability to achieve goals in the world (Zador, A. M., 2019). It is the ability to memorize and comprehend, recognize patterns, make adaptive decisions, and imagine and learn from experience (Borana, 2016).

Many AI techniques used for developing decision-making strategies are discussed in the literature. Since the 1980s, when AI started to gain prominence, the majority of studies have been algorithm-based (Ghahramani, 2020). Knowledge-based AI applications have evolved since the 1990s and are now widely used. The most significant advantage of these approaches over algorithm-based systems is that the problem definition and solution are independent of each other, and the learning process requires a more structured design (Lake et al., 2021).

The most commonly used AI techniques are listed below (Nabiyev, 2016):

- Heuristic approaches
- Fuzzy logic
- Expert systems
- Artificial neural networks
- Genetic algorithms
- Machine learning
- Reinforcement learning
- Deep learning approaches

There are many ways to build AI, some of which are illustrated Figure 1 (Saleh, 2019):

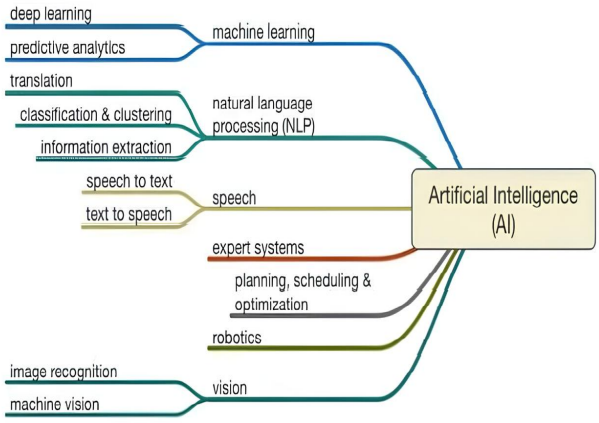

Figure 1. Artificial Intelligence

Applications for Artificial Intelligence

Artificial intelligence (AI) is a rapidly developing technology that has revolutionized many sectors in recent years. Defined as computer systems endowed with human-like thinking abilities, AI attracts attention with its capacity to perform complex tasks and its learning ability. The wide range of AI applications has caused a significant transformation in the world of technology. The main areas where AI is used are listed below (Chen et al., 2022):

Healthcare: AI has made a significant impact in the medical field by accelerating diagnosis and treatment processes (Razzak et al, 2018). In areas such as early disease detection, personalized treatment plans, and drug discovery, robotic surgery, patient monitoring and management, AI assists healthcare professionals by analyzing large datasets (Esteva et al., 2017; Zhang & Liu, 2020; Yamg et al., 2020Chen et al., 2021; Mishra & Li, 2022). For example, thanks to image processing technologies, high accuracy rates can be achieved in cancer diagnosis (Asan & Choudhury, 2021; Bickmore et al., 2021).

Finance: The finance sector uses AI in many areas such as investment analysis, risk management, fraud detection, and customer service (Yang et al., 2021). AI algorithms help analyze large datasets to predict market trends and develop investment strategies. Additionally, chatbots provide 24/7 customer support (Asatiani et al., 2023).

Automotive: Autonomous vehicles are one of the most striking examples of AI in the automotive industry. With the help of sensors and AI algorithms, vehicles can perceive their surroundings and move safely. These technologies not only contribute to the development of driverless cars but also bring innovations in traffic management and road safety (Garikapati, 2024).

Retail: The retail sector uses AI technologies to enhance customer experience. Recommendation systems offer personalized shopping experiences, while processes such as inventory management and demand forecasting are optimized with AI.

Furthermore, AI-powered chatbots and virtual assistants provide instant support to customers (Shankar et al., 2023).

Education: In the field of education, AI is used to personalize learning experiences. Intelligent tutoring systems can monitor student performance, identify weak areas, and offer suggestions accordingly. AI-supported language learning applications also offer students an interactive and effective learning environment (Ghali et al., 2018).

Art and Creativity: AI holds great potential in the fields of art and creativity. AI-supported applications can create new works in fields such as music, painting, and literature. For instance, music composed, or paintings created by AI can inspire human creativity (Elgammal, 2023).

Industry and Manufacturing: As a key component of Industry 4.0, AI enhances efficiency by automating production processes (Bogue, 2020). Robots equipped with AI algorithms can carry out complex production tasks more quickly and accurately: Smart manufacturing systems, predictive maintenance, quality control, supply chain management, simulation and modeling (Xu et al., 2018; Jayaraman & Keoleian, 2020; Zang, 2021; Wamba & Akter, 2020; Hsu et al., 2021). In addition, AI is used in maintenance processes to predict machine failures in advance (Zhang et al., 2022).

Service Sector: AI applications in the service sector offer significant innovations in enhancing customer experience, improving operational efficiency, and enabling personalized services. Some prominent AI applications that are becoming widespread in the service sector are as follows: Customer services and chatbots; personalized services; automated content creation; tourism and travel; education and learning (Wang et al., 2020; Gatt et al., 2018; Jannach et al., 2016; Adamopoulou et al., 2020; Zheng et al., 2021).

In sectors such as healthcare, finance, automotive, retail, education, art, and industry, AI applications provide significant benefits in terms of efficiency, accuracy, speed, and innovation. It is expected that AI technologies will continue to develop and become more widespread in the future. This is likely to have even greater impacts on society and the economy. For these reasons, it is important to raise individual and societal awareness of AI, identify existing shortcomings, and work on improvements.

Awareness and AI awareness

Awareness can be defined as the development of a conscious attention and perception of an individual's internal states, environmental stimuli and the interactions between these two areas (Chen et al., 2025). Artificial intelligence (AI) awareness is an individual's knowledge about the existence, functioning, usage areas and effects of AI technologies and the ability to interpret this information in a meaningful way in their daily life (Owsley and Greenwood, 2024). Awareness is related to subconcepts such as attention, consciousness, intuition and knowledge level and is a multidimensional structure with these aspects. Basically, Awareness involves the process of an individual having knowledge about an object, event or process and making sense of this information by processing it at the cognitive level (Dolgikh, 2024). This conceptual structure can be examined under three main headings: situational awareness, cognitive awareness and emotional awareness (Endsley and Jones, 2024). This awareness requires a more holistic understanding that is not limited to technical knowledge, but also includes ethical, social and cultural impacts (Owsley and Greenwood, 2024). Therefore, AI awareness; it is a multi-layered structure consisting of cognitive (what AI is and how it works), behavioral (ability to interact with AI technologies) and critical (evaluating the social consequences of AI) components (Chen, 2025). In today's digitalizing world, increasing these awareness levels of individuals are of great importance in terms of promoting the conscious and ethical use of technology.

The artificial intelligence awareness scale developed in this study is built based on the conceptual structure described above. The scale aims to measure individuals' level of knowledge about AI tech-

nologies, their attitudes towards technological applications, and their evaluations of the social effects of these technologies. In this context, a special emphasis has been placed on the cognitive and critical components of mindfulness; The approach has been adopted that it is not only necessary to have technological knowledge, but also to use this knowledge in a meaningful and responsible way. Thus, the scale developed is aimed to be based on a solid theoretical basis and to produce valid and reliable results in practice.

Artificial Intelligence Awareness Scale Development Process and Method

This section includes the research problem, the scale development process, and the population and sample of the study.

Research Problem

AI technologies are rapidly evolving and becoming more complex, making it difficult for individuals and society to understand them. An awareness scale can help assess how well this complexity is understood by measuring individuals' knowledge, perceptions, and attitudes toward AI technologies. The impact of AI is felt not only in the technology sector but also in healthcare, education, law, and the workforce. This broad impact necessitates that individuals and organizations understand both the potential opportunities and risks of AI. A scale that measures awareness can help determine how these effects are perceived and to what extent society is prepared for them.

Along with the development of AI, concerns about ethics and safety have also increased. Misuse or uncontrollable outcomes of AI systems can have serious societal impacts. An awareness scale can measure how sensitive individuals are to these ethical and safety issues, contributing to better risk management. Measuring awareness levels is essential to identify areas that require more education and awareness-raising efforts. A scale developed on AI awareness can identify knowledge gaps and make educational programs more effective. Public awareness of AI is also a key factor in forming public policies. An AI awareness scale allows policymakers to understand the public's concerns and needs and to make appropriate regulations accordingly. The adoption of AI technologies is directly related to individuals' attitudes toward them. An awareness scale can reveal how ready society is for these technologies and which factors play a role in the adoption process.

For these reasons, the AI Awareness Scale will be an important tool to help individuals and society better understand AI technologies consciously and effectively and to adapt to the changes brought by these technologies.

Scale Development Process

The AI Awareness Scale was developed by applying the three-stage scale development process proposed by Schwab. The stages of this process are as follows: 1) Generating the item pool, 2) Structuring the scale, 3) Evaluating the scale (Schwab, 2013). In the first stage, expert academics from fields such as business administration, computer engineering, organizational management, strategic management, and management information systems were consulted regarding employee awareness of AI. A focus group was formed with participation from these academics as well as managers/employees from the healthcare, manufacturing, and service sectors. The focus group, consisting of 9 members, discussed key issues in measuring AI awareness among employees, the criteria that should be used, and the appropriate language for scale items (Çalışkan, 2022; Demir & Akpınar, 2016). Additionally, interviews were conducted with the focus group members using semi-structured questions. The qualitative data obtained were analyzed using content analysis, and a 41-item pool was created. This item pool provided a comprehensive framework for measuring employee AI awareness. The items focused on key areas such as AI systems, mobile and smart devices, AI application areas, and smart enterprises — all considered to be essential aspects of the concept of "employee AI awareness."

In the second stage, a draft scale was created using the 41-item pool. Opinions were gathered from six experts in Turkish language, business administration, management information systems, strategic management, industrial engineering, and

computer engineering. The aim was to test the content validity of the items. Content validity refers to whether the items used in the measurement tool are quantitatively and qualitatively sufficient for measuring the intended characteristics. Expert opinions are commonly used to assess this (Başkale, 2016; Büyüköztürk, 2007: 167-182). The experts evaluated the draft scale based on criteria such as sensitivity, measurability, language coherence, content relevance, and clarity. Thus, it was ensured that the scale items addressed the core aspects of AI awareness, were adaptable to various sectors and activities, and were based on concrete and measurable objectives. It was important that the language of the items be clear and understandable so that the sample could easily grasp their meanings during implementation. According to the Lawshe method, items with a content validity ratio of zero or below were eliminated. Duplicate items or those expressing the same idea were removed or merged. The structuring of the scale was carried out in three sessions. In the first session, the scale was reduced to 23 items; in the second session, to 16 items. In the third session, a 14-item draft scale form was finalized. The resulting "Artificial Intelligence Awareness Scale Draft Form" is presented below in Table 1.

In the third phase, a two-step study was conducted to evaluate the scale. In the first step, a pilot application of the draft version of the "Artificial Intelligence Awareness Scale" was carried out in the healthcare sector. Quantitative data were collected through online and face-to-face surveys. In the pilot study, data were obtained from 132 participants working in the healthcare sector. After analyzing the collected data, it was decided to remove item 5 from the draft scale. As a result, the final version of the scale consisted of 13 items.

In the second step, the finalized scale items were administered to two separate study groups. To ensure the scale could be applicable across various sectors, it was decided to apply it in two different sectors instead of only one. Accordingly, the scale was administered to 139 employees in the automotive sector and 152 employees in the logistics sector. The data were analyzed using IBM SPSS and AMOS software. Exploratory and confirmatory factor analyses were conducted. Based on the analysis results, the one-dimensional structure of the 13-item Artificial Intelligence Awareness Scale was confirmed through confirmatory factor analysis. The findings indicated that the scale had an acceptable level of fit, and that it was a valid and reliable measurement tool. Participants evaluated the scale items using a 5-point Likert scale ranging from "1. Strongly Disagree" to "5. Strongly Agree." The Likert-type scale is a method used to measure individuals' attitudes with high reliability and validity (Tekindal, 2009; Tavşancıl, 2006).

Table 1. Draft Form of the Artificial Intelligence Awareness Scale

Number of Scale Items	Scale Items
I1	Artificial intelligence is a concept created by utilizing natural intelligence.
I2	Systems operating based on artificial intelligence are used in perception management.
I3	While shopping, AI-based systems help me determine the product I will buy.
I4	The main purpose of AI systems is to make human life easier.
I5	AI-based systems have no significant impact on commercial activities.
I6	Tasks that would take humans a long time to complete are performed by AI systems very quickly and without errors.
I7	Data obtained from mobile devices I interact with (phone, computer, etc.) is used by AI systems.
I8	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.
I9	Today, AI techniques are used in production and management activities in businesses.
I10	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.
I11	AI-powered robots are used to facilitate business operations.
I12	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.
I13	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.
I14	Almost all of our searches on the internet produce results using AI algorithms.

The internal consistency of the scale was assessed using the Cronbach's Alpha method. The survey designed for this study consisted of two parts: The first part included four demographic

items such as gender, age, educational background, and marital status. The second part included the 13-item Artificial Intelligence Awareness Scale. To assess the construct validity of the scale, both validity and reliability were tested, and confirmatory and exploratory factor analyses were performed for this purpose.

Population and Sample of the Study

Ethical approval for the study was obtained from Giresun University Rectorate's Ethics Committee for Social Sciences and Engineering Sciences Research, with the decision dated 06.11.2024 and numbered 10/GD-1. A random sample was used and quantitative research was conducted using both online and face-to-face data collection methods. Among the survey forms collected, 44 were found to be incomplete or incorrectly filled out and were therefore excluded from the evaluation—11 from the healthcare sector, 15 from the automotive sector, and 18 from the logistics sector. As a result, 132 forms from the healthcare sector (pilot study), 139 from the automotive sector, and 152 from the logistics sector were included in the evaluation. According to Bryman and Cramer (2012), in scale development studies, the number of participants should be at least 5 to 10 times the number of items in the scale. Since the scale used in this study consisted of 13 items, the minimum required number of participants is 130 (13 x 10 = 130). Therefore, reaching 139 participants in the automotive sector and 152 in the logistics sector indicates that the sample size was sufficient. The population of the study consisted of employees in the production and service sectors. The demographic characteristics of the participants from the healthcare sector (pilot study) and from the production and service sectors are presented in Table 2.

When examining the demographic characteristics of the participants in the healthcare sector, 50.8% were male, 45.5% were between the ages of 18 and 24, 65.2% held an associate degree, and 57.6% were single. According to the demographic characteristics of the participants in the automotive sector, 74.8% were male, 47.5% were between the ages of 18 and 24, 64.7% held an associate degree, and 66.9% were single. In the logistics sector, 59.9% of the participants were female, 62.5% were between the ages of 18 and 24, 61.2% held an associate degree, and 76.3% were single. Table 3 below presents the distribution of agreement levels with the items of the Artificial Intelligence Awareness Scale across the healthcare, automotive, and logistics groups.

Table 2. Distribution of demographic characteristics of the health automotive and service group

		Healthcare (n=132)		Automotive (n=139)		Logistics (n=152)	
		n	%	n	%	n	%
Gender	Male	67	50,8	104	74,8	61	40,1
	Female	65	49,2	35	25,2	91	59,9
Age	18-24	60	45,5	66	47,5	95	62,5
	25-34	44	33,3	54	38,8	36	23,7
	35-44	20	15,2	10	7,2	10	6,6
	45 and over	8	6,1	9	6,5	11	7,2
Education Level	High school	6	4,5	16	11,5	16	10,5
	Associate degree	86	65,2	90	64,7	93	61,2
	Bachelor's degree	24	18,2	29	20,9	39	25,7
	Postgraduate	16	12,1	4	2,9	4	2,6
Civil status	Married	56	42,4	46	33,1	36	23,7
	Single	76	57,6	93	66,9	116	76,3

When Table 3 is examined, the three items with the highest levels of agreement in the healthcare sector are: "Artificial intelligence techniques are used for solving problems such as image processing, facial recognition, and similar tasks. (4.13)", "The use of artificial intelligence-based systems is becoming widespread in various sectors such as education, healthcare, security, industry, agriculture, and tourism. (4.08)", and "The main software component of unmanned aerial vehicles and similar smart air stations consists of artificial intelligence algorithms. (4.09)". The three items with the lowest levels of agreement are: "AI-based systems have no meaningful impact on commercial activities. (2.48)", "AI-based systems help me decide what product to buy while shopping. (3.61)", and "Tasks that would take humans a long time can be performed quickly and flawlessly by AI systems. (3.77)".

In the automotive sector, the three items with the highest levels of agreement are: "The use of AI-based systems is becoming widespread in various sectors such as education, healthcare, security, industry, agriculture, and tourism. (4.12)", "The

main goal of AI systems is to make human life easier. (4.04)", and "Data obtained from mobile devices I interact with are used by AI systems. (4.04)". that would take humans a long time can be performed quickly and flawlessly by AI systems. (3.61)".

Table 3. Distribution of Participation Levels for the Artificial Intelligence Awareness Scale Items

		1		2		3		4		5			
Group	**Item**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**Ort**	**ss**
Health	Artificial intelligence is a concept created by utilizing natural intelligence.	4	3,0	9	6,8	13	9,8	74	56,1	32	24,2	3,92	0,94
	Systems operating based on artificial intelligence are used in perception management.	3	2,3	9	6,8	25	18,9	71	53,8	24	18,2	3,79	0,90
	While shopping, AI-based systems help me determine the product I will buy.	7	5,3	16	12,1	22	16,7	63	47,7	24	18,2	3,61	1,08
	The main purpose of AI systems is to make human life easier	4	3,0	8	6,1	20	15,2	62	47,0	38	28,8	3,92	0,98
	AI-based systems have no significant impact on commercial activities.	28	21,2	52	39,4	20	15,2	24	18,2	8	6,1	2,48	1,19
	Tasks that would take humans a long time to complete are performed by AI systems very quickly and without errors.	1	0,8	14	10,6	23	17,4	71	53,8	23	17,4	3,77	0,89
	Data obtained from mobile devices I interact with (phone, computer, etc.) is used by AI systems.	2	1,5	3	2,3	27	20,5	63	47,7	37	28,0	3,98	0,85
	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.	2	1,5	7	5,3	11	8,3	70	53,0	42	31,8	4,08	0,87
	Today, AI techniques are used in production and management activities in businesses.	0	0,0	6	4,5	23	17,4	72	54,5	31	23,5	3,97	0,77
	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.	0	0,0	6	4,5	23	17,4	73	55,3	30	22,7	3,96	0,77
	AI-powered robots are used to facilitate business operations.	1	0,8	7	5,3	21	15,9	74	56,1	29	22,0	3,93	0,81
	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.	0	0,0	3	2,3	19	14,4	68	51,5	42	31,8	4,13	0,74
	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.	0	0,0	7	5,3	14	10,6	71	53,8	40	30,3	4,09	0,79
	Almost all of our searches on the internet produce results using AI algorithms.	1	0,8	5	3,8	21	15,9	66	50,0	39	29,5	4,04	0,82
Automotive	Artificial intelligence is a concept created by utilizing natural intelligence.	5	3,6	9	6,5	20	14,4	69	49,6	36	25,9	3,88	0,99
	Systems operating based on artificial intelligence are used in perception management.	0	0,0	7	5,0	44	31,7	59	42,4	29	20,9	3,79	0,83
	While shopping, AI-based systems help me determine the product I will buy.	8	5,8	13	9,4	32	23,0	65	46,8	21	15,1	3,56	1,04
	The main purpose of AI systems is to make human life easier.	4	2,9	3	2,2	17	12,2	75	54,0	40	28,8	4,04	0,87
	Tasks that would take humans a very long time to complete are performed by AI systems very quickly and without errors.	5	3,6	14	10,1	30	21,6	71	51,1	19	13,7	3,61	0,97
	Data obtained from the mobile devices I interact with are used by AI systems.	2	1,4	3	2,2	17	12,2	83	59,7	34	24,5	4,04	0,77
	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.	1	0,7	6	4,3	13	9,4	75	54,0	44	31,7	4,12	0,80
	Today, AI techniques are used in production and management activities in businesses.	0	0,0	4	2,9	23	16,5	83	59,7	29	20,9	3,99	0,70
	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.	4	2,9	3	2,2	20	14,4	79	56,8	33	23,7	3,96	0,85
	AI-powered robots are used to facilitate business operations.	1	0,7	8	5,8	25	18,0	75	54,0	30	21,6	3,90	0,83
	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.	0	0,0	7	5,0	14	10,1	79	56,8	39	28,1	4,08	0,76
	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.	1	0,7	8	5,8	27	19,4	64	46,0	39	28,1	3,95	0,88
	Almost all of our searches on the internet produce results using AI algorithms.	2	1,4	9	6,5	34	24,5	60	43,2	34	24,5	3,83	0,92
Logistics	Artificial intelligence is a concept created by utilizing natural intelligence.	4	2,6	8	5,3	24	15,8	78	51,3	38	25,0	3,91	0,92
	Systems operating based on artificial intelligence are used in perception management.	3	2,0	11	7,2	30	19,7	73	48,0	35	23,0	3,83	0,93
	While shopping, AI-based systems help me determine the product I will buy.	7	4,6	19	12,5	37	24,3	51	33,6	38	25,0	3,62	1,13
	The main purpose of AI systems is to make human life easier.	1	0,7	6	3,9	31	20,4	74	48,7	40	26,3	3,96	0,83
	Tasks that would take humans a very long time to complete are performed by AI systems very quickly and without errors.	6	3,9	13	8,6	33	21,7	66	43,4	34	22,4	3,72	1,03
	Data obtained from the mobile devices I interact with are used by AI systems.	3	2,0	8	5,3	16	10,5	91	59,9	34	22,4	3,95	0,85
	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.	0	0,0	9	5,9	19	12,5	76	50,0	48	31,6	4,07	0,82
	Today, AI techniques are used in production and management activities in businesses.	1	0,7	4	2,6	26	17,1	71	46,7	50	32,9	4,09	0,81
	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.	1	0,7	9	5,9	21	13,8	79	52,0	42	27,6	4,00	0,85
	AI-powered robots are used to facilitate business operations.	3	2,0	9	5,9	24	15,8	73	48,0	43	28,3	3,95	0,93
	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.	3	2,0	5	3,3	10	6,6	73	48,0	61	40,1	4,21	0,86
	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.	1	0,7	10	6,6	22	14,5	64	42,1	55	36,2	4,07	0,91
	Almost all of our searches on the internet produce results using AI algorithms.	1	0,7	9	5,9	14	9,2	69	45,4	59	38,8	4,16	0,87

1: Strongly disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly agree

The two items with the lowest levels of agreement are: "AI-based systems help me decide what product to buy while shopping. (3.56)" and "Tasks

In the logistics sector, the three items with the highest levels of agreement are: "AI techniques are used to solve problems such as image processing and facial recognition. (4.21)", "Almost all of the

searches we make on the internet produce results using AI algorithms. (4.16)", and "The use of AI-based systems is becoming widespread in various sectors such as education, healthcare, security, industry, agriculture, and tourism. (4.07)". The two items with the lowest levels of agreement are: "AI-based systems help me decide what product to buy while shopping. (3.62)" and "Tasks that would take humans a long time can be performed quickly and flawlessly by AI systems. (3.72)". In all three sectors, the items with the highest levels of agreement are generally focused on the application and impact of AI in specific domains.

Results

The data were analyzed using SPSS 27.0 software with a 95% confidence level. Frequency (n) and percentage (%) values were reported for categorical (qualitative) variables, and mean (M) and standard deviation (SD) values for numerical (quantitative) variables. Exploratory Factor Analysis (EFA) was conducted to determine the factor structure of the scale. The structure of the scale was examined using Confirmatory Factor Analysis (CFA) based on the study data. The Cronbach's Alpha reliability coefficient was calculated.

Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis was conducted to determine the construct validity of the scales used in the study. According to Büyüköztürk (2007), when the total correlation of scale items and the factor loading value are 30% or higher, the items successfully differentiate participant responses. To assess the suitability of the sample for factor analysis, the KMO and Bartlett's tests were applied. The KMO coefficient was calculated to test sample adequacy, and Bartlett's test was used to assess the assumption of normal distribution. Whether to proceed with factor analysis was determined based on the result of the Bartlett test. For factor analysis to be conducted, the KMO value must be at least 0.50 and the Bartlett's test result must be statistically significant (Jeong, 2004: 70). After the factor analysis, factor loadings were examined to decide whether to assign items to specific factors or remove them from the scale. Additionally, in the item-total correlation analysis, each item's correlation coefficient must be greater than 0.300.

EFA was applied in responses received from a total of 291 people, including 139 employees in the automotive sector and 152 employees in the logistics sector.

Reliability Analysis

The Cronbach's Alpha coefficient has been calculated to test the reliability level of the scale. The value of the Cronbach's Alpha coefficient ranges between 0 and 1. Each value range of the Cronbach's Alpha coefficient indicating the reliability level of the scale is as follows (Nunnally, 1967, 248): Cronbach's Alpha = $,00 \leq \alpha < ,40$ the scale is not reliable. Cronbach's Alpha = $,40 \leq \alpha < ,60$ the scale has low reliability. Cronbach's Alpha = $,60 \leq \alpha < ,80$ the scale is fairly reliable. Cronbach's Alpha = $,80 \leq \alpha < 1,00$ the scale is highly reliable.

Confirmatory Factor Analysis (CFA)

To determine model adequacy, CFA was performed, and multiple fit indices were used. These indices help identify whether there are differences between the theoretical model and the empirical data, and highlight strengths and weaknesses. Commonly used indices include the Chi-Square Goodness of Fit Test, Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Root Mean Square Residual (RMR or RMS), and Root Mean Square Error of Approximation (RMSEA) (Cole, 1987; Sümer, 2000).

CFA was applied in responses received from a total of 291 people, including 139 employees in the automotive sector and 152 employees in the logistics sector.

Findings

Table 4 below presents the results of the item-total correlation analysis.

According to the item-total correlation analysis results of the Artificial Intelligence Awareness Scale presented in Table 4, the item with the lowest correlation coefficient is item 5: "Artificial intelligence-based systems have no significant impact on commercial activities." This item was removed

prior to the EFA. The correlation coefficients of the remaining 13 items are high (r > 0.300). Table 5 below presents the KMO and Bartlett's test results of the scale.

Table 4. Item-Total Correlation

	Item	Item-Total Correlation	Cronbach's Alpha if Item Deleted
I1	Artificial intelligence is a concept created by utilizing natural intelligence.	0,495	0,774
I2	Systems operating based on artificial intelligence are used in perception management.	0,412	0,782
I3	While shopping, AI-based systems help me determine the product I will buy.	0,444	0,779
I4	The main purpose of AI systems is to make human life easier.	0,379	0,785
I5	AI-based systems have no significant impact on commercial activities.	**-0,088**	0,834
I6	Tasks that would take humans a long time to complete are performed by AI systems very quickly and without errors.	0,317	0,789
I7	Data obtained from mobile devices I interact with (phone, computer, etc.) is used by AI systems.	0,379	0,784
I8	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.	0,523	0,772
I9	Today, AI techniques are used in production and management activities in businesses.	0,608	0,767
I10	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.	0,576	0,770
I11	AI-powered robots are used to facilitate business operations.	0,519	0,773
I12	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.	0,559	0,772
I13	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.	0,555	0,771
I14	Almost all of our searches on the internet produce results using AI algorithms.	0,439	0,780

When the results of the EFA for the Artificial Intelligence Awareness Scale in Table 5 are examined, the KMO value is found to be 0.851, which is greater than 0.50.

Table 5. KMO and Bartlett's Test Results for the Scale

KMO		0,851
Bartlett's Test	X^2	482,337
	Sd	91
	P	<0,001

This indicates that the sample size is sufficient for factor analysis (KMO > 0.500). The result of the Bartlett's test was calculated as X^2 = 482.337 and found to be significant (p < 0.05), indicating that the condition of normal distribution is met. Based on the outcomes of the KMO and Bartlett tests, it has been determined that the data used in the study are suitable for factor analysis of the Artificial Intelligence Awareness Scale. The Scree Plot (Eigenvalue distribution) is presented in Figure 2 below.

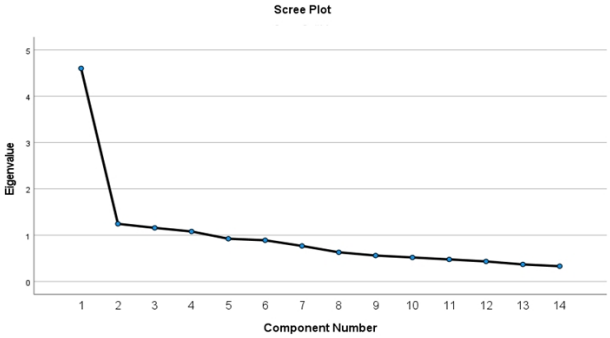

Figure 2. Scree Plot (Distribution of Eigenvalues)

Following the confirmation that the scale is suitable for factor analysis, an examination of its structure was conducted. Three sub-dimensions with eigenvalues greater than 1 were identified. However, in the analyses, sub-dimensions consisting of only one item were observed in the 2- and 3-factor structures. Additionally, the explained variance ratios of these sub-dimensions were found to be low. Similar results were obtained with different rotation methods. As shown in the Scree Plot in Figure 2, a single-factor structure is appropriate for the scale. Accordingly, the Artificial Intelligence Awareness Scale was evaluated as a single-factor structure. Table 6 presents the results of the EFA of the scale.

According to the results of Figure 2 and Table 6, it was decided that the Artificial Intelligence Awareness Scale consists of a single factor and 13 items. The factor loadings of the scale range between 0.381 and 0.721, and the total explained variance rate was calculated as 35.296%. There are no items in the scale with low factor loadings, that fail to represent the scale, or that are not distinctive (Factor loading > 0.300).

Table 6. Results of EFA for the Scale

Item No	Statements	Factor Loading	Explained Variance Ratio
I1	Today, AI techniques are used in production and management activities in businesses.	0,721	
I2	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.	0,714	
I3	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.	0,679	
I4	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.	0,676	
I5	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.	0,658	
I6	AI-powered robots are used to facilitate business operations.	0,638	
I7	Artificial intelligence is a concept created by utilizing natural intelligence.	0,595	35,296
I8	Almost all of our searches on the internet produce results using AI algorithms.	0,574	
I9	While shopping, AI-based systems help me determine the product I will buy.	0,543	
I10	Systems operating based on artificial intelligence are used in perception management.	0,491	
I11	Data obtained from mobile devices I interact with (phone, computer, etc.) is used by AI systems.	0,482	
I12	The main purpose of AI systems is to make human life easier.	0,451	
I13	Tasks that would take humans a long time to complete are performed by AI systems very quickly and without errors.	0,381	

CFA was applied on the responses received from a total of 291 people, including 139 employees in the automotive sector and 152 employees in the logistics sector. The fit indices of the CFA and the results of the CFA model fit are presented below in Table 7 (Meydan & Şeşen, 2015; Tabachnick & Fidell, 2012).

Table 7. Fit Indices of the Artificial Intelligence Awareness Scale for CFA

Index	Good Fit	Acceptable Fit	DFA Results
X^2	X	X	91,758
sd	X	X	61
X^2/sd	≤ 3	≤ 5	1,504
GFI	≥ 0,95	≥ 0,90	0,969
AGFI	≥ 0,90	≥ 0,85	0,953
CFI	≥ 0,97	≥ 0,90	0,976
RMR	≤ 0,05	≤ 0,08	0,028
RMSEA	≤ 0,05	≤ 0,08	0,035

Table 7 presents the CFA fit indices calculated for the Artificial Intelligence Awareness Scale. According to these results, the Chi-square goodness of fit, GFI, AGFI, CFI, RMR, and RMSEA indices indicate a good model fit. The validity of the scale has been confirmed, and the scale is consistent with the data obtained. Below, Figure 3 shows the path diagram generated in the CFA, and Table 8 presents the CFA results

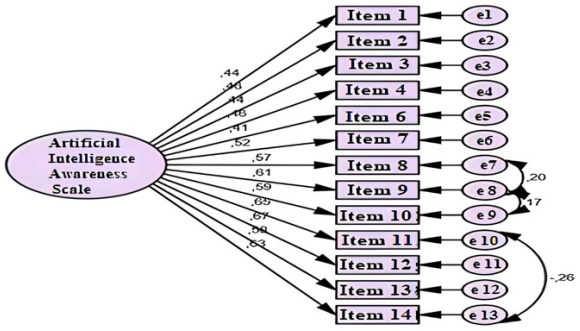

Figure 3. Roadmap Created in CFA

Table 8. CFA Results

Scale	Item	β	sh	t	p
Artificial Intelligence Awareness Scale	Item1	0,443			
	Item2	0,457	0,131	7,373	<0,001
	Item3	0,442	0,173	6,587	<0,001
	Item4	0,463	0,145	6,773	<0,001
	Item6	0,410	0,150	6,286	<0,001
	Item7	0,521	0,141	7,235	<0,001
	Item8	0,570	0,148	7,560	<0,001
	Item9	0,615	0,143	7,817	<0,001
	Item10	0,587	0,150	7,669	<0,001
	Item11	0,646	0,166	7,951	<0,001
	Item12	0,674	0,155	8,156	<0,001
	Item13	0,584	0,157	7,663	<0,001
	Item14	0,630	0,168	7,860	<0,001

The AVE and CR values of the Artificial Intelligence Awareness Scale are given in Table 9 below.

Table 9. Artificial Intelligence Awareness Scale AVE and CR Values

Scale	AVE	CR
Artificial Intelligence Awareness Scale	0.301	0.845

For the Artificial Intelligence Awareness Scale, the AVE (Average Variance Extracted) value was calculated as 0.301 and the CR (Composite Reliability) value as 0.845. Bagozzi et al. (1991) stated

that convergent validity is ensured when all items forming the scale factor are significant. Additionally, it has been emphasized that even if the AVE value is below 0.5, convergent validity can still be considered acceptable as long as the CR value exceeds 0.7 (Huang et al., 2013; Burić et al., 2016). The analysis results show that the CR value of the scale exceeds 0.7. Based on these findings, it can be concluded that the convergent validity of the scale is established. Table 10 below presents the reliability results.

Table 10. Reliability Analysis Results

Group	Cronbach's Alpha
Health	0,834
Automotive	0,810
Logistics	0,867

As shown in Table 10, the reliability coefficient of the Artificial Intelligence Awareness Scale exceeds 0.800 across all groups. This indicates that the scale has a very high level of reliability. Descriptive statistical values for the Artificial Intelligence Awareness Scale are presented in Table 11 below.

Table 11. Descriptive Statistics of the Artificial Intelligence Awareness Scale

Group	n	Mean	sd	Level	Skewness	Kurtosis
Health	132	3,94	0,50	78,76	-0,76	1,65
Automotive	139	3,90	0,48	78,05	-0,30	0,74
Logistics	152	3,96	0,56	79,27	-0,72	0,71

According to Table 11, participants from the healthcare sector showed a high level of agreement with the statements related to artificial intelligence, with an average agreement rate of 78.76%. This indicates that the majority of participants in this sector have a positive attitude toward artificial intelligence and acknowledge its benefits. Similarly, participants in the automotive sector also demonstrated a high level of agreement, with an average of 78.05%. This suggests a general acceptance of artificial intelligence in this sector as well, although slightly lower than in the healthcare sector. The logistics sector showed the highest average agreement level with AI-related statements at 79.27%. This implies that participants in the logistics sector have an even more positive view of artificial intelligence compared to the other sectors and perceive its potential in their field to be high. While the logistics sector had the highest average agreement level (79.27%) and the automotive sector had the lowest (78.05%), the agreement rates across all sectors were quite close and above 78%. This indicates that artificial intelligence is broadly accepted and perceived positively across all three sectors.

The "Artificial Intelligence Awareness Scale" developed as a result of this study is presented below in Table 12.

Table 12. Artificial Intelligence Awareness Scale

Number of Scale Items	Scale Items
I1	Artificial intelligence is a concept created by utilizing natural intelligence.
I2	Systems operating based on artificial intelligence are used in perception management.
I3	While shopping, AI-based systems help me determine the product I will buy.
I4	The main purpose of AI systems is to make human life easier.
I5	Tasks that would take humans a very long time to complete are performed by AI systems very quickly and without errors.
I6	Data obtained from the mobile devices I interact with are used by AI systems.
I7	The use of AI-based systems is becoming widespread in various sectors such as education, health, security, industry, agriculture, and tourism.
I8	Today, AI techniques are used in production and management activities in businesses.
I9	Our consumption tendencies can be predicted using AI techniques, and we receive feedback based on the information obtained.
I10	AI-powered robots are used to facilitate business operations.
I11	AI techniques are used for solving problems such as image processing, facial recognition, and similar issues.
I12	The main software component of unmanned aerial vehicles and similar smart air stations is AI algorithms.
I13	Almost all of our searches on the internet produce results using AI algorithms.

Discussion

In the study, a single-factor Artificial Intelligence Awareness Scale consisting of 13 items was developed.

The literature has been examined, and it has been seen that the studies on AI are generally scale

development or application studies for the health and education sector. The scale developed in this study is a measurement tool that can be used in all sectors.

Brougham and Haar (2018) developed a new measurement tool "STARA (Smart Technology, Artificial Intelligence, Robotics, and Algorithms) awareness" that describes how employees perceive technological developments in terms of their own jobs and careers, how they prepare for these possible changes, and to what extent their jobs can be modified by such technologies. It was found that STARA awareness was negatively associated with organizational commitment and career satisfaction, and positively related to turnover intentions, cynicism and depression.

Bakir et al. (2025) focused on raising AI awareness to increase employee engagement in the hospitality industry. They emphasized the importance of employee retention by providing insights to facilitate positive awareness of AI applications in the workplace. They stated that AI can cause negative concerns for employees, such as threats to change jobs, job insecurity, and higher turnover.

The Artificial Intelligence Awareness Level Scale for Teachers, which consists of the sub-dimensions of "Associating, Belief and Attitude, Theoretical Knowledge, Practical Knowledge", was developed by Ferikoğlu and Akgün in 2022.

"Artificial Intelligence Awareness Survey" was developed by Yılmaz (2021). The questionnaire consists of four sections: (1) introductory information section, (2) section questioning students' artificial intelligence usage status and internet usage status, (3) section questioning AI awareness, (4) open-ended questions section questioning students' thoughts on future artificial intelligence applications, and a total of 40 items.

Conclusion

The Artificial Intelligence Awareness Scale is an innovative tool developed to measure society's level of knowledge and attitudes toward AI technologies. In this study, a three-stage scale development process was completed. In the first stage of the process, in-depth interviews were conducted. Based on the content analysis of these interviews, an initial pool of 41 items was created. In the second stage, a draft of the scale was formed, and expert opinions were sought to ensure semantic, face, and content validity. In the final stage, the scale was evaluated and refined into a 14-item draft version. A pilot study was then conducted with 132 employees in the healthcare sector, resulting in the removal of one item. Subsequently, the final 13-item version of the scale was administered to 139 employees in the automotive sector and 152 employees in the logistics sector. The data collected were analyzed using IBM SPSS 21 and AMOS 21 through CFA and EFA. The analyses revealed a single-factor structure consisting of 13 items. CFA results indicated that the scale has an acceptable level of model fit. Cronbach's Alpha values were calculated as 0.834 for the healthcare sector, 0.810 for the automotive sector, and 0.867 for the logistics sector, confirming the scale's validity and reliability. As a result of this study, a significant tool has been introduced to measure employees' awareness of artificial intelligence across various sectors. This scale enables a better understanding of the societal impacts of AI technologies and facilitates the measurement of awareness levels toward these technologies.

With the rapid advancement of AI technologies and their increasing societal impact, the need for such an awareness measurement tool is evident in the literature (Floridi et al., 2020; Jobin et al., 2019). In this context, the developed scale addresses this gap by providing a means to identify individuals' knowledge gaps and misconceptions about AI. Additionally, the use of this tool can yield valuable insights into how AI technologies are perceived by the general public, thereby informing the development of educational programs and public policies (Cath et al., 2018). Moreover, the analysis results obtained from administering the scale across different sectors demonstrate that it can be applied universally across various industries. While this study represents an important first step in developing and implementing strategies to increase AI awareness, it would be beneficial for future studies to apply the scale to broader sample groups to further enhance its validity and reliability.

The developed scale is a powerful instrument that can be used to evaluate the effectiveness of educational and awareness programs, shape public policy, and understand how AI technologies are

being accepted by society. The Artificial Intelligence Awareness Scale will serve as a fundamental tool in efforts to increase social awareness of AI's social and economic impacts and to manage these impacts effectively. The development and application of such awareness measurement tools have the potential to help society make the best use of AI technologies while minimizing possible risks.

During the scale development process, a pilot application was carried out on 132 employees working in the health sector, and then 139 employees in the automotive sector and 152 employees in the logistics sector were reached in the applications made with the final scale. These sample numbers are one of the limitations of the research. In future research, scale can be applied in different sectors and by reaching a higher sample number.

One of the theoretical contributions of this study is to clarify the conceptual ambiguities in literature by considering artificial intelligence awareness as a multidimensional structure. The developed scale allows us to measure not only the technical knowledge of individuals about AI, but also their sensitivity to the ethical, social and cultural effects of these technologies. In this respect, the study provides a theoretical framework for understanding the critical thinking levels of individuals about AI technologies and contributes to areas such as digital literacy and technology ethics. The social significance of the scale is that it supports individuals to interact consciously and responsibly with AI technologies; This can have broader social implications, such as shaping education policies, addressing digital inequalities, and increasing participation in technology-based decision-making.

References

Adamopoulou, E., & Moussiades, L. (2020). Chatbot systems: A survey. Computer Science Review, 34, 100204. https://doi.org/10.1016/-j.cosrev.2019.100204

Asan, O., & Choudhury, A. (2021). Artificial intelligence and machine learning approaches to improving risk prediction and management in healthcare: a systematic review. *Journal of the American Medical Informatics Association,* 28(7), 1421-1429. https://doi.org/10.1093/jamia/ocab070

Asatiani, A., Apte, U. M., & Penttinen, E. (2023). Generative artificial intelligence in finance: risk considerations. *International Monetary Fund,* 2023/006, 1-25. https://doi.org/10.5089/979-8400236622.066

Awad, E., Dsouza, S., Kim, R., Schulz, J., Henrich, J., Shariff, A., Bonnefon, J. F., & Rahwan, I. (2020). The moral machine experiment. *Nature*, 563(7729), 59-64.

Bakir, S., Dogru, T., Bilgihan, A., & Ayoun, B. (2025). AI awareness and employee-related outcomes: A systematic review of the hospitality literature and a framework for future research. *International Journal of Hospitality Management*, *124*, 103973. https://doi.org/10.-1016/j.ijhm.2024.103973

Bickmore, T. W., & Marsella, S. (2021). Virtual human technologies for health care applications. Health Informatics Journal, 27(3), 211-223. https://doi.org/10.1177/1460458220937882

Bogue, R. (2020). Industrial robots: A review of recent developments. *Industrial Robot: An International Journal,* 47(4), 463-469. https://doi.org/10.1108/IR-12-2019-0213

Borana J., (2016), Applications of Artificial Intelligence & Associated Technologies,Proceeding of International Conference on Emerging Technologies in Engineering, Biomedical, Management and Science

Bostrom, N. (2021). The vulnerable world hypothesis. *Global Policy*, *12*(1), 45-60.

Brougham, D., & Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, *24*(2), 239-257. https://doi.org/10.1017/jmo.2016.55

Cath, C., Wachter, S., Mittelstadt, B., Taddeo, M., & Floridi, L. (2018). Artificial intelligence and the 'Good Society': The US, EU, and UK Approach. *Science and Engineering Ethics, 24*(2), 505-528.

Chen, H., Zhang, Y., & Zhang, C. (2021). A review of deep learning techniques for drug discovery. Journal of Biomedical Informatics, 113, 103638. https://doi.org/10.1016/.jbi.-2021.103638

Chen, X., Chen, R. R., Wei, S., & Davison, R. M. (2025). Herd behavior in social commerce: understanding the interplay between self-awareness and environment-awareness. *Internet*

Research, *35*(3), 947-980. https://doi.org/10.1108/INTR-05-2022-0359

Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). "Two decades of Artificial Intelligence in Education: Contributors, collaborations, Research Topics, challenges, and future directions." Educational Technology and Society, 25(1), 28–47.

Dolgikh, S. (2024). Self-awareness in natural and artificial intelligent systems: a unified information-based approach. *Evolutionary Intelligence*, *17*(5), 4095-4114. https://doi.org/10.1007/s12065-024-00974-z

Elgammal, A., Liu, B., Elhoseiny, M., & Mazzone, M. (2023). Art, Creativity, and the Potential of Artificial Intelligence. Computational Creativity, Artistic Behavior, and Tools for Creatives. Springer. https://doi.org/10.1007/978-3-031-15020-6

Endsley, M. R., & Jones, D. G. (2024). Situation awareness-oriented design: review and future directions. *International Journal of Human–Computer Interaction*, *40*(7),1487-1504. https://doi.org/10.1080/10447318.2024.2318884

Esteva, A., Kuprel, B., Novoa, R. A., et al. (2017). Dermatologist-level classification of skin cancer with deep neural networks. Nature, 542(7639), 115-118. https://doi.org/10.1038/nature21056

Ferikoğlu, D. (2021). Öğretmenler için yapay zekâ farkındalık düzeyi ölçeği: güvenilirlik ve geçerlilik çalışması (Yayımlanmamış Yüksek Lisans Tezi). Bahçeşehir Üniversitesi.

Floridi, L., & Cowls, J. (2020). AI Ethics: A Systematic Review of the Literature. Science and Engineering Ethics, 26(5), 2655-2683.

Garikapati, D., & Shetiya, S. (2024). Autonomous Vehicles: Evolution of Artificial Intelligence and the Current Industry Landscape. Big Data and Cognitive Computing, 8(4), 42. https://doi.org/10.3390/bdcc8040042.

Gatt, A., & Krahmer, E. (2018). Survey of the state of the art in natural language generation: Core tasks, applications and evaluation. Journal of Artificial Intelligence Research, 61, 65-170. https://doi.org/10.1613/jair.1.11153

Ghahramani, Z. (2020). Probabilistic Machine Learning and Artificial Intelligence. Nature, 521(7553), 452-459.

Ghali, M. A., et al. "An Intelligent Tutoring System for Teaching English Grammar." International Journal of Academic Engineering Research, vol. 2, no. 2, 2018, pp. 1–6.

Haenlein, M. & Kaplan, A. (2019). A brief history of artificial intelligence: On the past, present, and future of artificial intelligence. California ManagementRreview, 61(4), 5-14.

Hassabis, D., & Maguire, E. A. (2020). The Neuroscience-Inspired Artificial Intelligence. Neuron, 107(1), 15-19.

Hsu, C.-H., & Chen, Y.-S. (2021). Simulation-based optimization for manufacturing systems using artificial intelligence techniques. Computers & Industrial Engineering, 156, 107261. https://doi.org/10.1016/j.cie.2021.107261

Jannach, D., & Adomavicius, G. (2016). Recommender Systems: Challenges and Research Opportunities. Springer. https://doi.org/10.1007/978-3-319-29659-3

Jayaraman, V., & Keoleian, G. A. (2020). Predictive maintenance using artificial intelligence: A review. Journal of Quality in Maintenance Engineering, 26(3), 338-353. https://doi.org/10.1108/JQME-09-2019-0063

Jobin, A., Ienca, M., & Vayena, E. (2019). The Global Landscape of AI Ethics Guidelines. Nature Machine Intelligence, 1(9), 389-399.

Kartal E.,(2021). Machine Learning and Artificial Intelligence,Tıp Bilişimi,18.Bölüm,İstanbul Üniversitesi, Enformatik Bölümü, İstanbul, Türkiye,DOI: 10.26650/B/ET07.2021.003.18

Lake, B. M., Ullman, T. D., Tenenbaum, J. B., & Gershman, S. J. (2017, 2021 Updated Edition). Building Machines That Learn and Think Like People. Behavioral and Brain Sciences, 40, e253.

LeCun, Y., Bengio, Y., & Hinton, G. (2021). Deep Learning. Nature, 521(7553), 436-444.

Marcus, G. (2020). The Next Decade in AI: Four Steps Towards Robust Artificial Intelligence. AI Magazine, 41(3), 35-49.

Mishra, A., & Li, L. (2022). AI-driven patient monitoring systems: A review. Health Information Science and Systems, 10(1), 15. https://doi.org/10.1186/s13755-022-00733-3

Nabiyev. V.V., (2016), Yapay Zeka:İnsan-Bilgisayar Etkileşimi, Seçkin Yayıncılık San. ve Tic.A.Ş., ISBN:978-975-02-3727-0

Owsley, C. S., & Greenwood, K. (2024). Awareness and perception of artificial intelligence operationalized integration in news media industry and society. *Ai & Society*, *39*(1), 417-431. https://doi.org/10.1007/s00146-022-01386-2

Razzak, M. I., Naz, S., & Zaheer, R. (2018). Deep learning for medical image processing: Overview, challenges and the future. Classification in BioApps, 61-80. https://doi.org/10.1016/B978-0-12-814759-1.00004-8

Russell, S., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson Education.

Saleh Z.M.(2019), Artificial Intelligence Definition, Ethics and Standards,The British Universty in Egypt, Electronics and Communications: Law, Standards and Practice | 18ELEC07I

Silver, D., Schrittwieser, J., Simonyan, K., Antonoglou, I., Huang, A., Guez, A., ... & Hassabis, D. (2020). Mastering Chess and Shogi by Self-Play with a General Reinforcement Learning Algorithm. Science, 362(6419), 1140-1144.

Wamba, S. F., & Akter, S. (2020). How artificial intelligence improves supply chain management: A review. Journal of Supply Chain Management, 56(2), 25-40. https://doi.org/10.1111/jscm.12181

Wang, J., & Xiang, Z. (2020). The role of artificial intelligence in tourism: A review and research agenda. Tourism Management Perspectives, 34, 100665. https://doi.org/10.1016/j.tmp.2020.100665

West, S. M., Whittaker, M., & Crawford, K. (2019). Discriminating Systems: Gender, Race, and Power in AI. AI Now Institute.

Xu, C., Xu, X., & Wang, L. (2018). Smart manufacturing systems for Industry 4.0: A review. Journal of Manufacturing Science and Engineering, 140(8), 081007. https://doi.org/10.1115/1.4039686

Yang, Y., & Wei, X. (2021). Artificial intelligence applications in finance: A survey. Financial Innovation, 7(1), 31. https://doi.org/10.1186/s40854-021-00234-1

Yang, Y., & Zheng, X. (2020). Robotic surgery: Current status and future perspectives. Journal of Robotic Surgery, 14, 445-458. https://doi.org/10.1007/s11701-020-01123-2

Yudong Zhang, Saeed Balochian, Praveen Agarwal, Vishal Bhatnagar, Orwa Jaber Housheya, "Artificial Intelligence and Its Applications", Mathematical Problems in Engineering, vol. 2014, Article ID 840491, 10 pages, 2014. https://doi.org/10.1155/2014/840491

Zador, A. M. (2020). A Critique of Pure Learning and What Artificial Neural Networks Can Learn from Animal Brains. Nature Communications, 11(1), 1-7.

Zhang, L., & Liu, J. (2020). Personalized medicine in the era of artificial intelligence. Frontiers in Medicine, 7, 45. https://doi.org/10.3389/fmed.2020.00045

Zhang, Y., & Yang, X. (2021). Quality control in manufacturing using artificial intelligence: A review. IEEE Transactions on Industrial Informatics, 17(5), 3316-3326. https://doi.org/10.1109/TII.2020.3025282

Zhang, Y., & Zhao, X. (2022). Leveraging artificial intelligence for production optimization: A review. *Journal of Manufacturing Processes, 64*, 387-403. https://doi.org/10.1016/j.jmapro.2021.11.023

Zheng, L., & Li, S. (2021). Artificial intelligence in education: A review of recent advancements. Education and Information Technologies, 26(3), 3435-3464. https://doi.org/10.1007/s10639-020-10448-6