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USE OF ARTIFICIAL INTELLIGENCE IN BUSINESS IN EUROPEAN UNION COUNTRIES

Nurgül Erdal[1]

[1]Assistant Prof. Dr., Istanbul Gelisim University, Faculty of Economics, Administrative and Social Sciences, Department of Logistics Management, nerdal@gelisim.edu.tr, ORCID: 0000-0002-2961-3906

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Abstract

The rapid changes in information, transportation, and communication systems worldwide have necessitated the use of artificial intelligence, which has led to the adaptation of artificial intelligence applications across all business processes. This study is the research of artificial intelligence, which is seen as a competitive advantage, in businesses in the European Union countries. In the study, comprehensive research was conducted by taking secondary data from the Gen-AI-Report_October-2023 report, and the AI Statistics 2024 report. And.Europa.eu/eurostat/statistics Research questions were prepared and the related findings were shared. In the study, the rate of artificial intelligence use in European Union countries was 24.97%. It is estimated that the investment will be 2500 million dollars in 2032. The country that uses the most artificial intelligence is Denmark. The use of artificial intelligence by all SMEs is 13.48% in 2024. In 2024, the information and communication sector, and professional, scientific, and technical service activities used the most artificial intelligence applications. The average usage rate is 16%. The least used ones are real estate, accommodation, and construction sectors. There are a wide variety of artificial intelligence applications. Artificial intelligence is widely used in many business management processes such as data analysis, business processes, customer interactions, production, marketing, purchasing, accounting, management, etc. It especially accelerates the right decision-making process for business managers. As a result, the distribution by type and economic activity in European Union businesses does not exceed 50%. Therefore, businesses should prefer artificial intelligence to gain a competitive advantage.

Keywords: Artificial intelligence, european union management and organization, business competitive advantage.

Jel Classification: A10, M14, Q34

AVRUPA BİRLİĞİ ÜLKELERİNDEKİ İŞLETMELERDE YAPAY ZEKÂ KULLANIMI

Özet

Dünyada yaşanan bilişim, ulaşım ve iletişim sistemindeki hızlı değişimler yapay zeka kullanımını gerekli kılmış ve işletmeklerde tüm süreçlerine yapay zeka uygulamalarını adapte etmiştir. Bu çalışma rekabet avantajı olarak görülen yapay zekanın Avrupa Birliği ülkelerindeki işlermelerde araştırılmasıdır. Çalışmada ikincil veriler, Gen-AI-Report_October-2023 raporundan, Al statistisc ve Europa.eu/eurostat/statistics- raporundan veriler alınarak kapsamlı bir araştırma yürütülmüştür. Araştırma soruları hazırlanmış ve bunlarla ilgili bulgular paylaşılmıştır. Araştırmada, Avrrupa birliği ülkelerinde yapay zeka kullanım oranı % 24,97 bulunmuştur. 2032 yılında yatırımın 2500milyon dolar olacağı tahmin edilmektedir. En fazla yapay zekâ kullanan ülke Danimarka' dır. Tüm KOBİ'lerin yapay zekâ kullanımı 2024 yılı % 13.48 dir. 2024'te, bilgi ve iletişim sektörü, profesyonel, bilimsel ve teknik hizmet faaliyetleri en fazla yapay zekâ uygulaması kullanmıştır. Ortalama kullanım oranı ise % 16' dır. En az kullananlar ise, gayrimenkul, konaklama ve inşaat sektörüdür. Çok çeşitli yapay zekâ uygulamaları bulunmaktadır. Veri analizi, iş süreçleri, müşteri etkileşimleri, üretim, pazarlama, satın alma, muhasebe, yönetim vb. gibi birçok işletme yönetim sürecinde yaygın olarak yapay zekâ kullanılmaktadır. Özellikle işletme yöneticilerinin doğru karar verme sürecini hızlandırır. Sonuç olarak Avrupa Birliği işletmelerinde tür ve ekonomik faaliyete göre dağılımı % 50 geçmemektedir. Bu yüzden işletmeler rekabet avantajı sağlamak için yapay zekâyı daha çok tercih etmelidir.

Anahtar Kelimeler: Yapay zekâ, avrupa birliği, yönetim ve organizasyon, işletme, rekabet avantajı.

Jel Kodu: A10, M14, Q34

1. INTRODUCTION

Globalization, advancement of technology, and advancements in communication, transportation, and information technologies have made the use of artificial intelligence necessary. Especially the cheap and widespread use of the Internet has deeply affected the activities of people and businesses and changed their lifestyles. In the ever-changing world, businesses have adapted artificial intelligence applications to compete and continue their activities. Businesses and individuals benefit from artificial intelligence in daily life. Voice assistants, foreign language translation, recommendation sites, navigation, access to health services, access to banks, e-commerce, social security sites, entertainment sites, etc. sites make life easier. Businesses have given importance to digitalization to increase their effectiveness and efficiency and have used artificial intelligence in their business processes. Globalization, advancement of information, transportation and communication technologies, increase in international trade, and development of e-commerce have brought countries closer to each other and virtually eliminated borders. The best example of this is seen in the European Union countries. 28 countries affiliated with the European Union have made agreements among themselves and provided many benefits economically, socially, culturally, psychologically, and politically.

The member countries of the European Union were established in 1958 under the name of the European Economic Community. It currently has 28 members. The initial aim of this organization is to increase regional trade and support sustainable development. This sustainability is included in (education, health, environmental transformation, and fundamental rights) (Balcertak & Pietrzak, 2016: 3). Today, with the emergence of artificial intelligence technologies, businesses have begun to adapt them to themselves. Thus, industries are changing and developing thanks to these technologies (Yastıoğlu, 2023: 214). When artificial intelligence and data analytics are combined in businesses, it becomes easier for managers to know customers and determine their requests and expectations. Managers make appropriate inferences about the customer by knowing all their autonomy and trying to connect them to the business (Haenlein et al., 2019: 341). One of the most important achievements of technology, artificial intelligence aims to increase efficiency and productivity in businesses by automating processes with computers having human-like intelligence (Süleymanoğulları et al., 2024: 14). Information technologies facilitate economic growth and provide a competitive advantage. The rate of information technology use in the world is increasing, and businesses are changing their business processes and supporting them with artificial intelligence applications. While the Transformation Performance Index of European Union countries is 67.6%, the Transformation Performance Index of countries outside the EU is 53.8%. As can be seen here, EU countries are in an important position in the world (Altıntaş, 2024: 118). Especially the fact that EU countries stand out in technology and adapt artificial intelligence to their businesses has revealed their economic strength.

Artificial intelligence, one of the most important achievements of technology, aims to increase the effectiveness and efficiency of businesses by automating processes with computers having human-like intelligence (Süleymanoğulları et al., 2024: 14). Artificial intelligence is an information technology sector that generally

works with machines that resemble human-like work (Pallathadka et al., 2023: 2610). With the rapid growth of artificial intelligence applications and their use in daily life and business life, jobs previously done by humans have begun to be done by artificial intelligence (Sestino & De Mauro, 2022: 16). This situation is also considered a new industrial revolution (Soh & Connolly, 2020: 168; Chowdhury et al., 2022: 31). Artificial intelligence imitates human intelligence and uses robotics and computer software to do this (Telli, 2019: 186). Artificial intelligence applications, one of the areas of use of "Big Data", play a key role in the digitalization of businesses (Özbek, 2024: 255). Artificial intelligence is witnessing a new industrial revolution. In this context, it affects societies, businesses, and employees and changes their activities (Chowdhury et al., 2022: 31).

Artificial intelligence contributes positively to the management of the business and the effectiveness and efficiency of its processes (Cubric, 2020: 2). Businesses benefit from artificial intelligence data, make inferences from them, and provide more accurate planning by predicting sales and minimizing uncertainties (Mantri & Mishra, 2023: 2). Artificial intelligence feeds business developments throughout the stages (Mishra & Tripathi, 2021: 2) Artificial intelligence, which emerged with the Industry 4.0 process, increases its effectiveness in every area of life. Research shows that artificial intelligence determines and shapes social life (Adaş & Erbay, 2021: 328). Artificial intelligence is rapidly developing in business performance and employee performance, facilitating human life and all processes of the business and contributing positively to performance. Thanks to artificial intelligence, positive indicators such as safe and fast transportation, increased efficiency, accurate and efficient production, low-cost and fast production, sales, marketing, customer evaluation, and making the right decisions emerge. In addition to these activities, artificial intelligence also includes technologies such as data mining, computer vision, speech recognition, natural language production, machine learning, or deep learning. Artificial intelligence provides a competitive advantage because it better predicts the demands and needs of businesses' customers. Competitive businesses should benefit from the advantages provided by artificial intelligence to maintain their superiority. Managers should implement a strategic management strategy by considering the advantages and disadvantages of artificial intelligence and reducing risks (Aktepe & Karakulle, 2023: 45). Artificial intelligence algorithms are also changing in parallel with the advancement of technology. For example, while traditional artificial intelligence algorithms are used to identify patterns in a training dataset and make predictions, generative artificial intelligence uses machine learning algorithms to produce new outputs based on the training dataset (Gen-AI-Report_October-2023).

Almost everywhere in the world, businesses use artificial intelligence technology and their usage rates are increasing day by day. As of 2023, the global artificial intelligence market is estimated to be $454.12 billion. The North American AI market is the largest in the world with a market share of 36.84% The largest artificial intelligence market size is located in North America. With an estimated value of $87.18 billion to $167.3 billion in the US and $43.7 billion in Canada, the North American AI industry accounts for more than a third (36.84%) of the global AI market share (Al statistic, 2024). In 2024, 13.48% of self-employed businesses with 10 or more employees in the EU use at least one of the following artificial intelligences (Eurostat, 2025).

Artificial intelligence is widely used in many processes such as data analysis, business processes, customer interactions, production, marketing, purchasing, accounting, and management, etc. of businesses. It allows managers or leaders to make faster, more efficient, and more accurate decisions and gain competitive advantage. Effective communication is provided between stakeholders and businesses thanks to artificial intelligence. This study was conducted due to the limited number of studies on the use of artificial intelligence in businesses in the literature. It examines the use of artificial intelligence in businesses in European Union countries, which are very important for individuals and businesses today and are an important region of artificial intelligence investment and use in the world. Secondary data was used in the study. Comprehensive research was conducted by taking data from the Gen-AI-Report_October-2023 report, .europa.eu/eurostat/statistics report, and Al statistisc 2024 report.

This study will answer the following questions.

- Question 1. What are the size statistics of the artificial intelligence market in the world?
- Question 2. What is the rate of artificial intelligence use by businesses in European Union countries?
- Question 3. What are the growth statistics of the global artificial intelligence market in the world between 2022 and 2032?
- Question 4. What is the comparison of businesses using artificial intelligence technologies in European Union Countries, in 2023 and 2024?
- Question 5. What is the artificial intelligence usage rate of SMEs in European Union Countries?
- Question 6. What is the percentage of businesses using artificial intelligence technologies in European Union businesses according to economic activity in 2024?
- Question 7. What are the types of artificial intelligence technologies used in European Union businesses in 2024?
- Question 8. What is the distribution of artificial intelligence technologies in European Union businesses according to type and economic activity in 2024?

Such publications are increasing day by day as the importance of artificial intelligence applications is understood and they provide a competitive advantage in businesses. His study is expected to reveal the current trend in artificial intelligence and to be a model for future research. The research will contribute to the literature, academics, students, and practitioners.

2. LITERATURE REVIEW

2.1. European Union Countries

Throughout history, countries have had to fight to reveal their national power. Technological advances and international order require countries to live in an environment of peace rather than war. European countries have formed unions to ensure peace and to strengthen economically (Kurter & Şahin, 2024: 146). The European Economic Community (EEC) was established in 1957 with the Treaty of Rome as a community aiming at the economic integration of its members. With the establishment of the European Union (EU) in 1993, it was

included in the European Union under the name of the European Community (EC). In 2009, it was completely transferred to the EU. The purpose of establishing this organization was a single market and customs union. West Germany, Belgium, France, the Netherlands, Italy, and Luxembourg united to form the European Union. These countries aimed to integrate economically. In 1965, with the Brussels Treaty, it acquired the European Coal and Steel Community (ECSC) and the European Atomic Energy Community (EAEC) along with various other organizations. In 1993, it established a market known as the internal market, which would provide the free movement of goods, capital, services, and people within the EEC. This internal market was formalized in 1994 and grew to include many of the European Free Trade Association member countries (Avrupa_Ekonomik_Topluluğu, 2025).

Table 1. The European Union Countries

Members	**Countries**
Founding Members	Germany, Belgium, France, Netherlands, Italy, Luxembourg (1952)
Other Members	Austria (1995), United Kingdom (1973), Bulgaria (2007), Czech Republic (2004), Denmark (1973), Estonia (2004), Finland (1995), Croatia (2013), Ireland (1973), Spain (1986), Sweden (1995), Greek Cypriot Administration of Southern Cyprus (2004), Latvia (2004), Lithuania (2004), Hungary (2004), Malta (2004), Poland (2004), Portugal (1986), Romania (2007), Slovakia (2004), Slovenia (2004), Greece (1981)

Source: (Kandemir & Özarı, 2024: 457).

Table 1 shows the countries that are members of the European Union. This union contributes to its members economically and socially and supports them. There have been many studies on European integration recently. In addition to the regional integration or convergence of the members of the European Union, the political and economic dynamics of the EU are intended to create the organizational logic of national policies and the policy-making process (Ladrech, 1994: 69).

2.2. Artificial Intelligence

One of the most important contributions of technological developments is artificial intelligence. McCarthy (2004) defined artificial intelligence as “the science and engineering of creating human-like intelligent machines, especially intelligent computer programs". Artificial intelligence is a technology that allows computers to think, learn, and make decisions (Bilge, 2017: 113). Artificial intelligence appears to have emerged in the early 20th century in its modern sense. In 1936, Alan Turing defined a test that formed the basis of modern computers to investigate whether machines could think like humans. This test, based on mathematical logic, was called the "Turing Test". This test measures whether the computer behaves like a human. It is not possible to distinguish artificial intelligence from the human element (Sucu & Ataman, 2020: 42). To pass the test successfully, natural and artificial intelligence must not be distinguishable. In 1957, Herbert Simon stated that there are machines that think, learn, and create. These machines can do the same things that humans can do. (Russel & Norvig, 2010: 20-21). One of the most widely known examples of artificial intelligence that won the Loebner Award is A.L.I.C.E. There are criticisms about this and similar software because it is based on talking (Sucu & Ataman, 2020: 43). Artificial intelligence technology generally reaches big data through the Internet of Things and is a technology that collects big data and performs cognitive actions such as perception, learning, thinking, problem-solving, and decision-making and exhibits autonomous behaviors similar to human intelligence (Nabiyev, 2016;

Kaplan & Haenlein, 2019; Özçelik, 2022: 2122). Various definitions of artificial intelligence in the literature are given in Table 2.

Table 2. Definitions in Artificial Intelligence Literature

The Study Containing The Definition	Definition
Nilsson (1990)	Artificial intelligence is a theory that aims to create imitations of natural intelligence.
Kurzweil (1992)	Artificial intelligence is the art of creating machines that perform functions that require intelligence to be performed by humans.
McCarthy (2004)	Artificial intelligence is the science and engineering of creating human-like intelligent machines, especially intelligent computer programs.
Nabiyev (2012)	Artificial intelligence is an intelligent program that solves complex problems and produces answers not only to specific problems but also to new situations.
Akyürek (2013)	Artificial intelligence is the simulation of the ability to perform tasks related to mental processes that can perform functions such as thinking, reasoning, learning, making sense, generalizing, and learning from experience, created by imitating the working principles of the human brain or central nervous system through artificial neural networks.
UNESCO (2017)	Artificial intelligence is a way to make education more personalized, flexible, inclusive, and engaging by processing real-time data.
Uludag Exporters' Associations (2017)	Artificial intelligence is an artificial operating system that is expected to exhibit high-level cognitive functions (perception, reasoning, learning, problem-solving, communication, and decision-making) and autonomous behaviors specific to human intelligence.

Source: (İncemen & Öztürk, 2024: 28).

As seen in Table 2, there are many different definitions of artificial intelligence. Many researchers have conducted various studies on artificial intelligence. The sub-dimensions of artificial intelligence are shown in detail in Figure 1. These are examined as machine learning, deep learning, swarm intelligence, cybernetics, and robotics (Köse, 2020: 294).

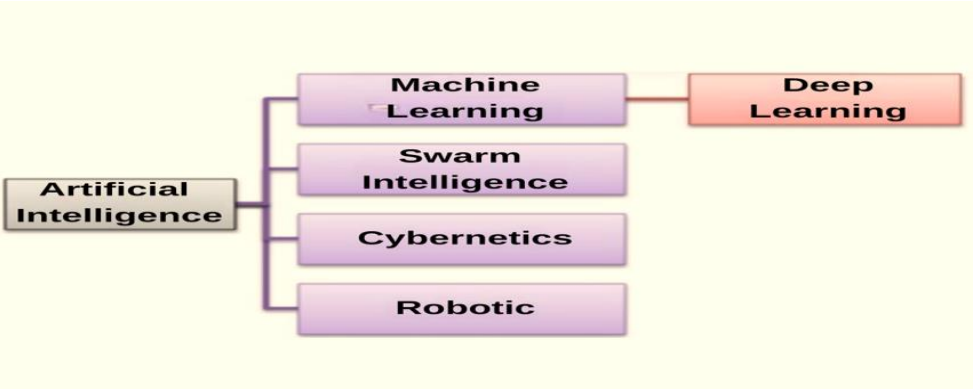

Figure 1. Artificial Intelligence Sub-Fields

Source: (Köse, 2020: 294).

Figure 1 shows artificial intelligence and its sub-dimensions. The first of these is machine learning. This is the type of artificial intelligence that provides solutions based on learning. Artificial intelligence techniques show problem recognition and solution generation by optimizing various variables based on the known results of a problem (Domingos, 2012: 78). In machine learning, success depends on sampling and success increases if the data set is correct and consistent (Köse, 2020: 92). Deep learning: Although this is known as a sub-dimension

of machine learning, it is different from it. Deep learning is the advanced version of Artificial Neural Networks and finds solutions to problems by working with big data (Sullivan, 2019: 759). Swarm Intelligence: It is not dependent on the learning processes of artificial intelligence. It is an optimization-oriented approach based on the collective and swarm problem-solving of living beings in nature. It indicates that many people show common behavior against common problems. Cybernetics is based on the control of living and non-living matter dating back to ancient times. In our age, cybernetics is a sub-dimension of artificial intelligence used in fields such as electronics, mechanical, and material engineering (Köse, 2017: 21). Robotics allows robots to be designed and developed as intelligent systems. This can produce solutions in connection with fields such as electronics, mechanical and material engineering, and even biomedical and chemical engineering (Köse, 2020: 292-294).

Artificial intelligence is also called intelligent software. This software is frequently used today. Non-intelligent software reduces the efficiency and effectiveness of businesses. E-learning, E-education, innovation, and adapting to changes are related to artificial intelligence. Artificial intelligence includes intelligent robots, artificial neural networks, digital systems, self-learning machines, intelligent software, and hardware (Özbek, 2024: 256). Especially with the Fourth Industrial Revolution, the use of artificial intelligence in businesses has increased and many studies have been conducted in the literature (Efe, 2021: 124; Berberlioğlugil, 2023: 84). Businesses use artificial intelligence technology to gain a competitive advantage and maintain their activities. They do this in production lines, logistics services, customer service, chatbots, financial analysis, and applications such as machine learning. Businesses that actively use artificial intelligence technologies achieve success in organizational structure and business processes (Sarnıç & Acar, 2024: 156).

2.3. Use of Artificial Intelligence in Business

Today, the changes experienced in the fields of informatics, communication, and transportation have rapidly increased the demand for e-transformation applications in both private sector organizations and public institutions and organizations (Altunal & Özbek, 2024: 127). One of the best examples of this is artificial intelligence applications in businesses. Artificial intelligence is an umbrella concept and the general name of many information systems. Artificial intelligence is used not only in science and engineering but also in almost all sciences (Kaplan, 2016: 7). Today, first-generation artificial intelligence applications are frequently used in businesses. For example, they enabled Facebook to recognize faces in images and tag users, they allowed Siri to understand your voice and act accordingly, and they enabled Tesla to develop autonomous cars. In the future, artificial intelligence will be seen in its second generation, that is, in a structure that can reason autonomously for undesigned tasks, make plans and solve problems. We can see the third generation of artificial superintelligence, which are truly self-aware and conscious systems that somehow make humans unnecessary (Kaplan and Haenlein, 2019, p.16). Artificial intelligence is considered one of the technologies that have an important role in industrial and economic development (Kar et al., 2022: 2). Although AI applications are widely used in industry, their common features are shown in Table 3.

Table 3. Basic Components of an AI Solution

Component	Solution
Data Entry (Input Data)	Historical: e.g. customer's past transaction data, external credit rating information. Real-time: e.g. beacons in stores or tracking of online activity Information: Past product recommendations that have been accepted or rejected
Processing algorithm	Supervised learning: e.g. Cancer detection Unsupervised learning: e.g. Identifying items purchased together or finding related images in a photo database Reinforced learning: e.g. Board game.
Output decision	Result: e.g. Credit rating score Selection of results: e.g. Selection of videos that may violate YouTube's terms of service and require further analysis by the content curation team. Action: e.g. Self-driving car has full autonomy to drive, steer

Source: (Canhoto & Clear 2020: 184).

Table 3 shows the basic components of artificial intelligence. Artificial intelligence has significant effects on both customers and businesses (Canella, 2018: 26; Jarek & Mazurek, 2019: 52). In our age, artificial intelligence is not only a technological product but also a tool that improves business processes and creates business opportunities. Therefore, organizations should position jobs and processes with the help of artificial intelligence. They should evaluate artificial intelligence applications throughout the organization and provide strategic superiority (Davenport & Ronanki, 2021: 109). Since businesses have just met artificial intelligence, they have not yet fully adapted it to their business. Modern businesses should increase the use of artificial intelligence to the intended level (Ünal & Kılınç, 2020: 63).

Artificial intelligence affects all businesses, whether large or small. It provides a better understanding of customers predicts their wishes and needs, and provides customers with a personalized experience. Artificial intelligence can be used to evaluate the market environment, catch and predict trends in the market, develop smarter advanced services and products, automate key business processes, and improve operational efficiency. It is envisaged that more artificial intelligence will be used in business models and ways of doing business in the future (Marr, 2020: 22-23). Robots are used to provide cheap labor. For example, in Japan, approximately 400,000 robots are working on different production tasks in factories, and this number is increasing rapidly. Businesses are rapidly investing in robots, and it is estimated that the number of robots will exceed computers by 2050 (Passig, 2011: 103-104). Artificial intelligence technology has been accepted as a supportive value-generation tool as a topic of interest in business management in recent years. Smarter products, smarter services, and smarter business processes constitute the different foundations of the applications of artificial intelligence to business life (Marr, 2020: 27).

The benefits of using Artificial Intelligence in businesses are as follows.

- Artificial intelligence automates routine and repetitive tasks in businesses, reduces human error, and speeds up processes. In this way, businesses save both time and cost and increase their efficiency.
- Artificial intelligence analyzes large data sets and offers managers the opportunity to make more accurate and faster decisions.

- It provides a competitive advantage by providing insight into issues such as customer behavior and market trends.
- Operational efficiency is increased by providing process automation in areas such as production, logistics, and finance. Especially in the industrial sector, robotic systems and artificial intelligence can be integrated within the framework of "Industry 4.0".
- Advanced user experience is provided in customer service and marketing areas with chatbots, virtual assistants, and personalized recommendation systems.
- Businesses innovate using artificial intelligence technologies and increase their competitiveness in the global market. The use of artificial intelligence is increasing in new product and service development processes.
- Artificial intelligence is used in cybersecurity systems to predict and prevent threats. In addition, artificial intelligence plays an active role in areas such as fraud detection in the finance sector.

3. METHOD

3.1. Purpose and Importance of Research

The use of artificial intelligence in today's businesses is increasing day by day. This study was planned with the following objectives in mind.

To examine the status of artificial intelligence use in businesses in European Union countries: To determine to what extent, in which areas, and with what types of systems businesses in EU countries use artificial intelligence technologies.

To conduct sectoral analysis: To identify which sectors use artificial intelligence more intensively and explain the reasons.

To contribute to policies and regulations: To provide data that will shed light on the legal regulations of the European Union regarding artificial intelligence.

To understand the competitiveness of businesses: To analyze the advantages of businesses using artificial intelligence in terms of efficiency, cost reduction, and customer satisfaction.

To reveal the challenges encountered: To investigate the technical, ethical, economic, or legal obstacles encountered in the adoption of artificial intelligence.

To provide suggestions for the future. To develop strategic suggestions to increase the adaptation of artificial intelligence in EU businesses.

3.2. Method

Today, businesses use information technologies in addition to traditional applications and plan their processes accordingly. First, an in-depth literature review was conducted to learn about the use of artificial intelligence in European Union businesses. Artificial intelligence applications used in businesses in European Union countries between February 1, 2025, and March 5, 2025 were examined. Data were taken from Gen-AI-Report_October-2023, AI statistics 2024 report, Europa.eu Eurostat statistics data. An in-depth literature review was conducted

to determine the artificial intelligence used in businesses in European Union countries and eight questions were created. These questions are:

- Size of the world artificial intelligence market,
- What percentage of enterprises in the European Union use artificial intelligence,?
- The growth rate of the world's global artificial intelligence market between 2022-2032,
- Comparison of the use of artificial intelligence technologies by enterprises in the European Union in 2023 and 2024,
- The rate of artificial intelligence use by SMEs in the European Union,
- The percentage of enterprises using artificial intelligence technologies in European Union enterprises by economic activity in 2024,
- Types of artificial intelligence technologies used in European Union enterprises in 2024,
- Distribution of artificial intelligence technologies by type and economic activity in European Union enterprises in 2024,

The collected data was examined with Word Microsoft Excel 2015, table, graphics, and ratio analysis.

4. FINDINGS

The research questions are explained below.

Question 1. What are the size statistics of the artificial intelligence market in the world?

Artificial intelligence has caused radical changes in many areas from people's work life to family life. Artificial intelligence is changing business life and social life and is creating an economic power. According to 2023 data, the global artificial intelligence market is worth approximately $455 billion. The most common area of use of artificial intelligence in the business world is customer service (56%). In a survey conducted by Microsoft, SME owners (79%) want to learn more about the benefits of artificial intelligence in the workplace and how it can be applied to their companies. Figure 2 shows the world artificial intelligence market (AI Statistics, 2024).

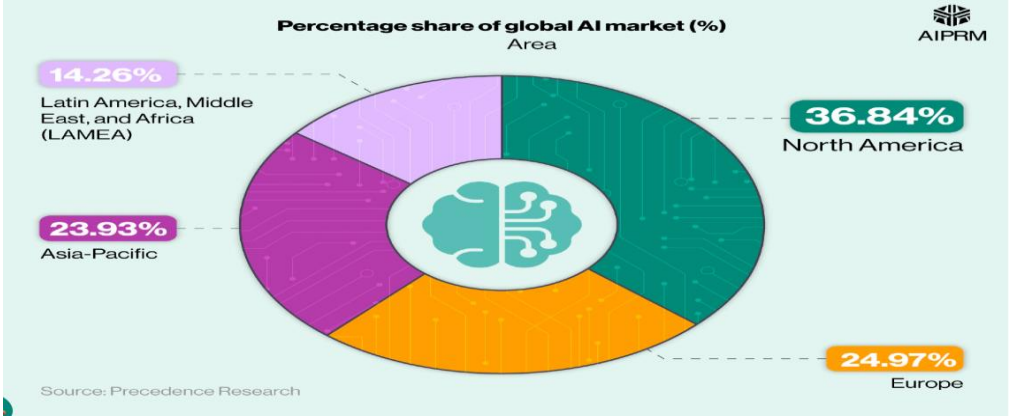

Figure 2. Shows The World Artificial Intelligence Market

Source: (AI Statistics, 2024).

Figure 2 shows the distribution of statistics on the size of the world's artificial intelligence AI market by region (2022). By 2023, the world's artificial intelligence market is estimated to be between $136.55 billion and $454.12 billion. North America dominates the artificial intelligence market by 36.84%. This is followed by Europe with 24.9%, Asia-Pacific with 23.93%, and Latin America, Central Asia, and Africa with 14.26%. The most common area of use of artificial intelligence in the business world is customer service (56%). More than three-quarters of SME owners surveyed by Microsoft (79%) are researching the benefits of artificial intelligence in the workplace and how to adapt it to their companies.

Question 2. What is the rate of artificial intelligence use by businesses in European Union countries?

24.9% of the companies using artificial intelligence in the world are located in Europe. (AI Statistics 202

Question 3. What are the growth statistics of the global artificial intelligence market in the world between 2022 and 2032?

Globalization, technological advances, and fierce competition have changed the way businesses operate. Companies that adapt artificial intelligence to businesses gain more advantages and become more successful than their competitors. That's why businesses that use artificial intelligence are increasing every year. Figure 3 shows how much the artificial intelligence market share will increase in 10 years.

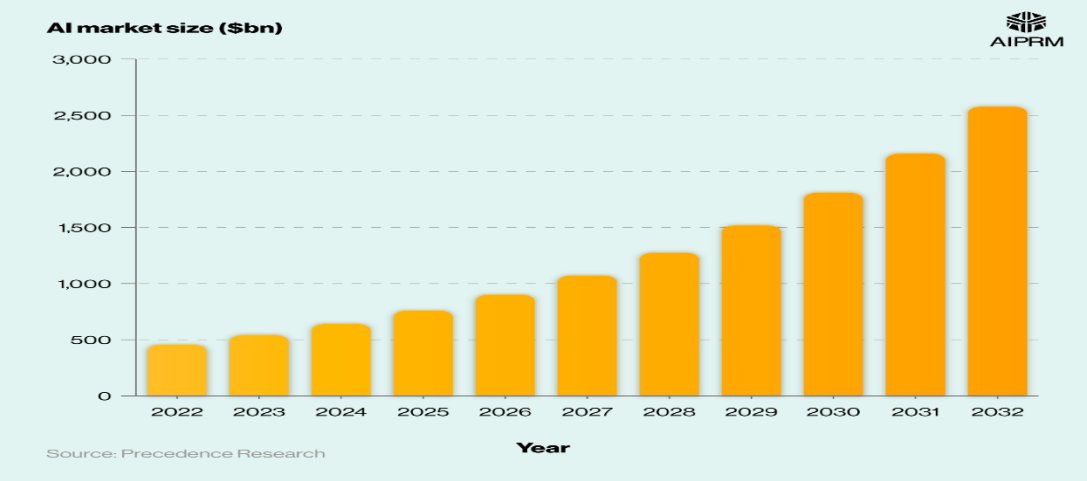

Figure 3. Artificial Intelligence Growth Statistics Between 2022-2032

Source: (Al Statistics, 2024).

Figure 3 shows the artificial intelligence growth estimate between 2022 and 2032. The artificial intelligence growth rate, which was $400 billion in 2020, is expected to exceed $2500 billion by 2032 and the compound annual growth rate (CAGR) is expected to be 19%.

Question 4. What is the comparison of businesses using artificial intelligence technologies in European Union Countries, in 2023 and 2024?

Figure 4. shows the comparison of businesses using artificial intelligence technologies in European Union countries in 2023 and 2024.

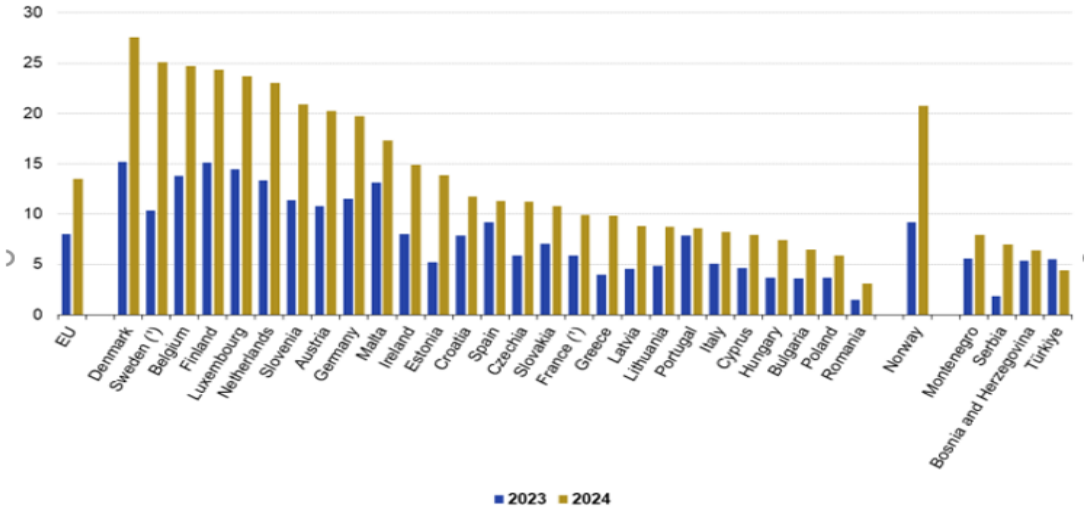

Figure 4. Artificial Intelligence Usage Rate in European Union Countries in 2023-2024

Source: (ec.europa.eu/eurostat/statistics-explained).

Figure 4 shows the rate of AI usage in European Union countries. When we examine the businesses that use little AI technology in EU countries, we know that the share of businesses using AI is between 3.07% and 27.58%. We see that Denmark ranks first among businesses in European Union countries (27.58%). This is followed by Sweden (25.09%), and Belgium (24.71%). The lowest rates are seen in Romania (3.07%), Poland (5.9%), and Bulgaria (6.47%). When all EU Member States are compared in 2023 and 2024, it is seen that the rate increases. The highest increase was seen in Sweden (14.72 %) while the lowest increase was seen in Portugal (0.77 %). In Türkiye, the rate was 5.51% in 2023 and 4.42% in 2024. Although the rate of artificial intelligence use has increased in businesses in European countries, it has decreased in businesses in Türkiye. If businesses that want to gain a competitive advantage implement artificial intelligence applications into their business processes, their competitiveness will increase.

Question 5. What is the artificial intelligence usage rate of SMEs in European Union Countries?

SMEs, which have an important place in the world, are adapting artificial intelligence to their business styles and processes every day. Table 4 shows the rate of artificial intelligence use in European Union countries in 2023 and 2024 in detail.

Table 4. Enterprises Using AI Technologies by Size Class, EU, 2023 and 2024 (% of Enterprises)

SMEs	**2023 (%)**	**2024 (%)**
Small enterprises	6.38	11,21
Medium enterprises	13.04	20,97
Large enterprises	30.40	41.17
All enterprises	8.03	13.48

Source: (ec.europa.eu/eurostat/statistics-explained).

Table 4 shows the rate of artificial intelligence use in European Union countries in 2023 and 2024. Just as the rate of artificial intelligence use by businesses all over the world is increasing, the rate of artificial intelligence use is increasing in European Union countries. It is seen that large-scale enterprises use artificial intelligence the most. While the artificial intelligence use rate of large-scale enterprises was 30.40% in 2023, it increased to % 41.17 in 2024. This is followed by medium-sized enterprises. While the artificial intelligence usage rate of medium-sized enterprises was % 13.04% in 2023, it increased to % 20.97% in 2024. In small-sized enterprises, the rate of artificial intelligence usage is increasing rapidly. While these were % 6.38% in 2023, they reached %11.21% in 2024. The usage rate of all enterprises was 8.03% in 2023 and % 13.48% in 2024.

Question 6. What is the percentage of businesses using artificial intelligence technologies in European Union businesses according to economic activity in 2024?

Thanks to technological advances, businesses that want to gain competitive advantage have started to use artificial intelligence. While some areas of activity use it more, some areas of activity use it less. Businesses using artificial intelligence according to economic activities in 2024 are shown in Figure 5.

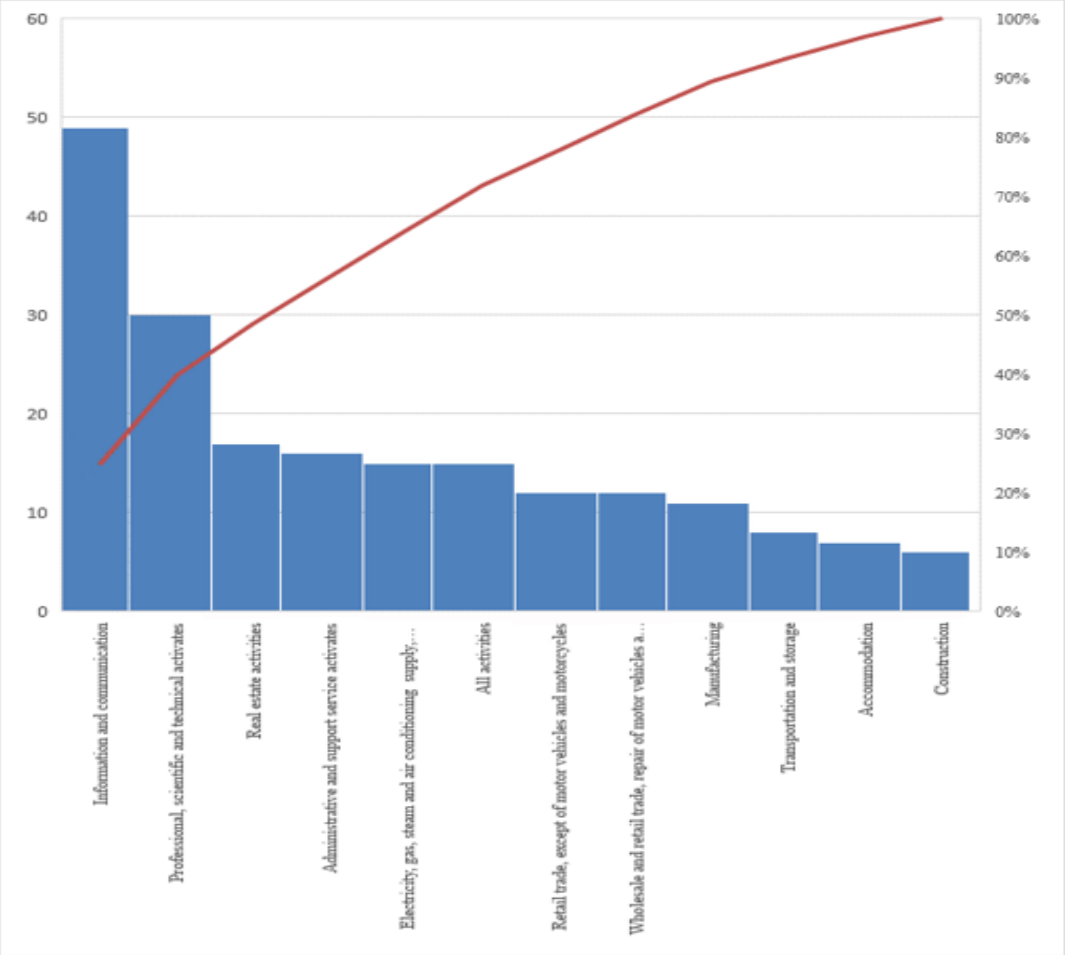

Figure 5. Enterprises Using Al Technologies by Economic Activity, EU 2024 (% of enterprises)

Source: (ec.europa.eu/eurostat/statistics-explained).

As seen in Figure 3, the businesses using the most artificial intelligence in 2024 were the information and communication sector (48.72%). The reason for this is that the information and communication sector allows the use of artificial intelligence. Professional, scientific, and technical service activities (30.53%) are in second place. The rate of businesses using artificial intelligence in all economic activities remained below 16%. Those below the average ranged from 15.45% (real estate activities) to 6.09% (accommodation and construction).

Question 7. What are the types of artificial intelligence technologies used in European Union businesses in 2024?

Various artificial intelligence technologies are used in various economic activities in European Union countries. These technologies are performing analysis of written language (text mining), generating written or spoken language (natural language generation, converting spoken language into machine-readable format (speech recognition), machine learning (e.g. deep learning) for data analysis, automating different workflows or assisting in decision making, ide flying objects or persons based on images (made recognition image processing) and enabling physical movement of machines via autonomous decisions based on observation of the environment. Table 5 shows in detail the artificial intelligence technologies used in economic activities.

Table 5. Businesses Using AI Technologies, by Type of AI Technology and Economic Activity, EU, 2024 (% of businesses)

Activities	Performing analysis of written language (text mining)	Generating written or spoken language (natural language generation	Converting spoken language into machine-readable format (speech recognition)	Machine learning (e.g. deep learning) for data analysis	Automating different workflows or assisting in decision-making	Ide flying objects or persons based on images (made recognition image processing)	Enabling physical movement of machines via autonomous decisions based on observation of surrounding
All activities	6.88	5.41	4.78	4.24	4.19	3.23	1.01
Manufacturing	4.58	3.53	2.94	2.73	3.23	2.74	1.46
Electricity, gas, steam and air conditioning supply, water supply; sever age, waste management and remediation activities	5.52	4.00	4.18	4.75	4.57	3.16	1.13
construction	2.81	2.42	2.54	0.83	0.95	1.49	0.35
Wholesale and retail trade, repair of motor vehicles and motorcycles	5.98	5.03	3.83	2.96	3.24	2.63	0.80
Retail trade, except for motor vehicles and motorcycles	5.06	4.52	3.23	2.83	2.79	2.87	0.58
Transportation and storage	3.70	3.52	2.83	3.23	2.33	2.40	0.83
Accommodation	3.25	2.15	1.69	1.37	1.37	1.06	0.37

Information and communication	30.11	25.83	20.13	25.66	21.20	13.54	3.43
Real estate activities	7.20	5.80	6.75	2.93	4.52	2.15	0.45
Professional, scientific, and technical activities	15.61	11.51	12.49	11.35	10.30	7.35	1.67
Administrative and support service activities	8.06	4.96	4.91	3.96	4.25	2.96	0.69

Source: (ec.europa.eu/eurostat/statistics-explained).

Table 5 shows the artificial intelligence technologies used in various economic activities. They are shown in detail. They are mostly used in Information and communication activities. Performing analysis of written language (text mining) 30.11%, generating written or spoken language (natural language generation) 25.83%, converting spoken language into machine-readable format (speech recognition) 20.13%, machine learning (e.g. deep learning) for data analysis& 25.66, automating different workflows or assisting in decision making 21.20%, ide flying objects or persons based on images (made recognition image processing)% 13.54 and enabling physical movement of machines via autonomous decisions based on observation of the environment 3.43%. Its use in all areas of activity is Performing analysis of written language (text mining) 6.88%, generating written or spoken language (natural language generation) 5.41% converting spoken language into machine-readable format (speech recognition) 4.78%, machine learning (e.g. deep learning) for data analysis 4.24% automating different workflows or assisting in decision making 4.19%, ide flying objects or persons based on images (made recognition image processing) % 3.23 and enabling physical movement of machines via autonomous decisions based on observation of the environment % 1.0.

Question 8. What is the distribution of artificial intelligence technologies in European Union businesses according to type and economic activity in 2024?

Artificial intelligence applications will be used in European Union businesses in 2024. Among all businesses, 34.8% of artificial intelligence is used in marketing and sales, 27.51% in management organization, 23.9% in production processes, 22.65% for accounting and finance management, 22.38% for information security, 13.59% for research and development (RAD) or innovation activities and 16.2% for logistics. Table 6 shows the detailed artificial intelligence usage rate according to economic activities.

Table 6. Distribution of European Union enterprises by type and economic activity in 2024

Activities	For marketing or sales	For the organization of business administration processes or management	For production processes	For accounting, casseroling finances management	For IT security	For research and development (RAD)or innovation activity	For logistics
All activities	34.08	27.51	23.49	22.65	22.38	18,59	6.12
Manufacturing	27.11	22.26	25.23	20.19	24.27	16,91	9.41
Electricity, gas, steam and air conditioning supply, water supply; sever age, waste management and remediation activities	23.22	30.51	25.48	18.58	34.81	16,48	5.22
construction	21.35	25.45	11.43	22.54	17.54	9.93	2.96

Wholesale and retail trade, repair of motor vehicles and motorcycles	45.95	24.89	13.16	18.88	19.67	9.60	9.56
Retail trade, except for motor vehicles and motorcycles	52.89	22.75	11.47	14.40	13.16	7.38	12.40
Transportation and storage	24.54	28.06	18.43	21.68	27.99	9.74	18.78
Accommodation	49.01	27.64	14.89	19.54	15.46	4.15	3.44
Information and communication	41.80	35.83	36.89	21.32	27.91	43.46	3.78
Real estate activities	41.16	22.25	20.09	26.28	21.08	9.43	3.58
Professional, scientific, and technical activities	23.87	27.35	29.10	29.80	19.75	20.43	1.95
Administrative and support service activities	33.90	30.37	20.44	24.95	23.48	11.45	5.68

Table 6 shows the rate of artificial intelligence usage by economic activities in all sectors. The highest number of artificial intelligence applications is in the Retail trade, except for motor vehicles and motorcycles sector in marketing and sales (52.89%). In the Information and communication sector, artificial intelligence is used the most for management and organizations (35.8%). In the Information and communication sector, it is used the most in the production process (36.89%). In the Professional, scientific, and technical activities sector, artificial intelligence is found the most in accounting and finance (29.80%). In the Electricity, gas, steam, and air conditioning supply, water supply; severe age, waste management, and remediation activities sector, it is IT security (34.81%). In the Professional, scientific, and technical activities sector, it is research and development (43.46%). In the Transportation and storage sector, artificial intelligence technologies are used the most in logistics activities (18.78%).

5. DISCUSSION

Today, the global artificial intelligence market is growing rapidly and many businesses are investing in artificial intelligence. Artificial intelligence technologies provide various conveniences to both individuals and businesses. The businesses that use artificial intelligence the most in the world are located in North America. This is followed by Europe, Asia-Pacific, Latin America, Central Asia and Africa. This study investigates the use of artificial intelligence, which is seen as a competitive advantage, in European Union businesses. European Union countries, which rank second in the world in artificial intelligence use, widely use artificial intelligence in their business activities. These are; management and organization, finance and accounting, customer relations, production processes, cyber-attacks, information security, research and development, logistics, etc.

According to the research results, European businesses rank second in the world in artificial intelligence use with 24.9%. However, this number will increase over time. The rate of using at least 1 artificial intelligence in businesses in European Union countries varies between 3.07% and 27.58%. The businesses that use artificial intelligence applications the most are Denmark. This is followed by Sweden, Belgium, Finland, Luxembourg, Netherlands, Slovakia, Norway, Austria, Germany, Malta, Ireland, and others. The lowest are Romania, Austria and Bulgaria. Although the rate of artificial intelligence usage has increased in almost all European countries, in Türkiye, the rate was 5.51% in 2023 and decreased by 4.42% in 2024. The reason for this can be considered as the high cost of artificial intelligence applications in Türkiye (60.7%) and the lack of sufficient experts (53.8%) (Erdal, 2025).

Considering that the vast majority of businesses in the world and Türkiye are SMEs, research findings show that the businesses that use artificial intelligence applications the most are large-scale businesses, followed by medium and small-scale businesses. The rate of SMEs using artificial intelligence in European Union member countries increased from 6.38% in 2023 to 11.21% in 2024. In addition, the usage rate of all businesses in the European Union increased from 8.03% in 2023 to 13.48% in 2024. As can be understood from this, the rate of artificial intelligence usage is increasing rapidly.

The vast majority of AI technologies are in the information and communication sector. These are primarily the analysis of written language (text mining). This is followed by the production of written or spoken language (natural language generation), the conversion of spoken language into a machine-readable form (speech recognition), and machine learning for data analysis. The least used AI applications are applications such as providing physical movement of machines through autonomous decisions, designing flying objects or people based on images (recognition through image processing), automating different workflows, or helping with decision-making. Considering the rapid change, speed, and cost of business processes, AI applications will develop further and provide positive advantages in business processes.

The sector with the highest number of AI applications is the retail trade sector, excluding motor vehicles and motorcycles in marketing and sales. In the information and communication sector, AI is mostly used in management and organizations. In the information and communication sector, it is mostly used in the production process. In the professional, scientific, and technical activities sector, AI is mostly found in accounting and finance. In the supply of electricity, gas, steam and air conditioning, and water; IT security in the sewerage, waste management, and improvement activities sector. In the professional, scientific, and technical activities sector, it is research and development. In the transportation and storage sector, AI technologies are mostly used in logistics activities.

Today, various reports are used to evaluate the use of artificial intelligence. One of these is the Artificial Intelligence in 2024: McKinsey Report. This report states that there will be an increase in Value Creation and Artificial Intelligence use in 2024 (McKinsey, 2024). The European Digital Economy and Society Index (DESI) is used to track artificial intelligence applications in European Union countries. This index tracks performance in the areas of digital connectivity, digital skills, online activity, and digital public services. It is to determine the areas that require priority investment by evaluating the status of digitalization in European Union countries (DESI, 2024).

There are several organizations in the world related to AI. One of them is the OECD Working Group on the Governance of Artificial Intelligence (AIGO). This organization is an online interactive platform dedicated to promoting trustworthy, human-centered artificial intelligence (AI). Launched by the OECD in 2020, the Observatory has become an important resource for policymakers, researchers, businesses, and civil society,

providing a comprehensive look at global AI initiatives, trends, and governance frameworks. The European Union, the Council of Europe, the United States the United Nations, and other jurisdictions benefit from the OECD's AI system and lifecycle (AIGO, 2024).

6. CONCLUSION

This research shows that artificial intelligence technologies are becoming increasingly widespread in businesses in the European Union countries. Artificial intelligence is used at a high rate, especially in the information and communication and professional services sectors. Sectors that use artificial intelligence; the pharmaceutical, finance, retail, manufacturing, media, architecture, interior design, engineering, automotive, aviation, defense,

medical, electronics, and energy sectors benefit from artificial intelligence in their businesses. In addition, all large enterprises in the world, regardless of sector, use artificial intelligence in their supporting processes covering many organizations, including marketing, design, corporate communication, education, and software engineering. It provides a competitive advantage to businesses in many areas, from production to customer relations, from cyber security to logistics.

The European Union ranks second in the world in artificial intelligence use after North America; these rates are increasing every year. In contrast, the decrease in artificial intelligence use rates in Türkiye points to structural problems such as high costs and lack of experts. In Europe, the transition to artificial intelligence is gaining momentum, especially in SMEs, led by large enterprises. This study only examined the use of artificial intelligence in European Union countries. So this is the limitation of this study. Future researchers can examine the use of AI in the world with different methods.

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