Shamil Aliverdiyev
Azerbaijan State Oil and Industry University
https://orcid.org/0009-0008-4808-3315
aliverdievsamil@gmail.com

The Impact of Artificial Intelligence on the Digital Transformation of Corporate Information Systems

Abstract

In recent years, the integration of Artificial Intelligence (AI) into information systems has transformed the development, operation, and strategic value of these systems. AI technologies such as machine learning, natural language processing, and intelligent automation have begun to play a key role in enhancing data-driven decision-making, improving system efficiency, and reducing human error. Organizations are now able to examine enormous volumes of data in real time because to this connection, revealing previously hard-to-find actionable insights. Over time, AI-powered systems become more efficient without requiring continual human involvement since they can adjust and learn from fresh data. AI also improves prediction skills, which enables companies to more accurately foresee consumer behavior, market trends, and operational hazards. Because of this, integrating AI strategically into information systems has become essential to preserving competitive edge and advancing digital transformation. This study aims to analyze the role of AI in the development of information systems, particularly focusing on areas such as intelligent data management, predictive analytics, user personalization, and system adaptability. It also evaluates the opportunities and challenges brought by AI-supported information systems in both public and private sectors. The study highlights how AI-driven solutions contribute to operational innovation, security enhancement, and strategic management within information system frameworks.

Keywords: artificial intelligence, information systems, intelligent automation, machine learning, data analytics, digital transformation, decision support systems, knowledge management

Şamil Əliverdiyev
Azərbaycan Dövlət Neft və Sənaye Universiteti
https://orcid.org/0009-0008-4808-3315
aliverdievsamil@gmail.com

Süni intellektin rəqəmsal transformasiyaya təsiri korporativ informasiya sistemləri

Xülasə

Son illərdə Süni İntellektin (AI) informasiya sistemlərinə inteqrasiyası bu sistemlərin inkişafını, fəaliyyətini və strateji dəyərini dəyişdirdi. Maşın öyrənməsi, təbii dil emalı və ağıllı avtomatlaşdırma kimi süni intellekt texnologiyaları verilənlərə əsaslanan qərarların qəbul edilməsinin təkmilləşdirilməsində, sistemin səmərəliliyinin artırılmasında və insan səhvlərinin azaldılmasında əsas rol oynamağa başlayıb. Təşkilatlar indi real vaxt rejimində böyük həcmdə məlumatı araşdıra bilirlər, çünki bu əlaqə ilə əvvəllər tapmaq çətin olan hərəkətə keçə bilən anlayışları ortaya qoyur. Zaman keçdikcə süni intellektlə işləyən sistemlər daimi insan iştirakını tələb etmədən daha səmərəli olur, çünki onlar yeni məlumatları tənzimləyə və öyrənə bilirlər. Süni intellekt həmçinin proqnozlaşdırma bacarıqlarını təkmilləşdirir ki, bu da şirkətlərə istehlakçı davranışını, bazar tendensiyalarını və əməliyyat təhlükələrini daha dəqiq proqnozlaşdırmağa imkan verir. Buna görə də, AI-nin strateji olaraq informasiya sistemlərinə inteqrasiyası rəqabət üstünlüyünü qorumaq və rəqəmsal transformasiyanı inkişaf etdirmək üçün vacib hala gəldi. Bu tədqiqatın məqsədi məlumat

sistemlərinin inkişafında AI-nin rolunu təhlil etmək, xüsusən də məlumatların intellektual idarə edilməsi, proqnozlaşdırıcı analitika, istifadəçinin fərdiləşdirilməsi və sistemin uyğunlaşması kimi sahələrə diqqət yetirməkdir. O, həmçinin həm dövlət, həm də özəl sektorda süni intellektlə dəstəklənən informasiya sistemlərinin gətirdiyi imkanları və çətinlikləri qiymətləndirir. Tədqiqat süni intellektə əsaslanan həllərin informasiya sistemi çərçivəsində əməliyyat innovasiyasına, təhlükəsizliyin artırılmasına və strateji idarəetməyə necə töhfə verdiyini vurğulayır.

Açar sözlər: süni intellekt, informasiya sistemləri, intellektual avtomatlaşdirma, maşin öyrənməsi, məlumat analitikası, rəqəmsal transformasiya, qərar dəstəyi sistemləri, biliklərin idarəedilməsi

Introduction

In today's digital age, information systems constitute the basic building blocks in many areas from decision-making processes to daily operations of institutions. Making these systems more effective, faster and more flexible is directly related to technological developments. Artificial intelligence (AI), in particular, plays a revolutionary role in the evolution of information systems. Artificial intelligence-based technologies enable systems to gain advanced capabilities such as not only data collection and storage functions, but also learning, interpretation and suggestion.

When integrated into information systems, artificial intelligence allows institutions to achieve high efficiency in many areas from data analysis to resource allocation, from customer relations to risk management. Thanks to this integration, systems have become structures that are not only based on past data, but also produce predictions for the future and provide active support to decision processes. On the other hand, artificial intelligence applications present new opportunities for information systems, as well as new challenges such as ethics, security and data privacy.

Research

The aim of this study is to examine the role of artificial intelligence in the development of information systems from both technical and managerial perspectives, to evaluate its effects on institutions and to present future predictions. Within the scope of the study, the application areas of different artificial intelligence approaches within information systems will be discussed; analyzes will be made on dimensions such as decision support systems, intelligent automation and user experience.

Although the beginning of artificial intelligence studies can be traced back to Cezeri's (1136-1206) robot drawings, the importance of artificial intelligence studies in the modern sense occurred during and after the Second World War. Alan Mathison Turing changed the fate of the war by inventing the first fully automatic code-breaking machine, which he called "Bombe" during the Second World War and which could be considered important under the conditions of that day. After the Second World War, many researchers, especially Alan Turing, started to work on artificial intelligence independently. Alan Turing gave the first conference on artificial intelligence in 1947 and explained that intelligent machines could be invented by combining artificial intelligence and computer programs. In his article "Computing Machinery and Intelligence" published in 1950, Alan Turing discussed the question "Can machines think?" Turing, who made explanations based on the combination of the words "machine" and "thinking", established the intellectual foundations of artificial intelligence. Although Alan Turing is considered the father of artificial intelligence, the term "artificial intelligence" was first used in a workshop on artificial intelligence organized by John McCarthy at Dartmouth College in 1956. In addition to John McCarthy, important names in the field such as Marvin L. Minsky (Massachusetts Institute of Technology-MIT), Nathaniel Rochester (International Business Machines-IBM) and Claude Shannon (Bell Laboratories) also participated in this event. In the continuation of this event, artificial intelligence studies gained momentum and important artificial intelligence programs such as Aziz (1961), Benzesim (1963), Eliza (1965), Bilgin (1970) and Stajyer (1979) were developed (Kutlusoy, 2019). The first human-like intelligent robot was built in Japan in 1972 under the name WABOT-I (Acar, 2020). However, between 1974 and 1980, many publications were published that criticized artificial intelligence studies negatively, and states were influenced by these articles and stopped allocating funds for artificial intelligence studies.

This period is called the "Artificial Intelligence Winter". In the 1980s, the field of artificial intelligence gained momentum again when England allocated funds to compete against Japan in artificial intelligence studies. In 1997, the defeat of world chess champion Garry Kasparov in a chess match by the program "Deep Blue" produced by IBM made a big splash. In this match, Garry Kasparov competed against a program that could process 200 million chess moves per second and lost. With this incident, it was seen that computers could be better than humans in some subjects. In the early 2000s, artificial intelligence first entered homes with the vacuum cleaner called "Roomba".

Driverless vehicles under the control of artificial intelligence have begun to be used in many states in America. So what will happen as a result of all this? Has artificial intelligence surpassed or will it surpass human intelligence? What will happen in the future? In order to understand artificial intelligence, human intelligence must first be understood and defined. Artificial Intelligence and Human Intelligence Artificial intelligence studies, which are the result of imitating human intelligence, can be described as machines modeling human learning. Considering that learning processes in humans occur in the brain, it seems possible to examine the structure of the brain and create it on machines. Artificial neural networks have been created on computers and the learning process has been simulated, based on the fact that learning in humans occurs through the interaction of brain cells called neurons. According to McCarthy, who is considered one of the pioneers of artificial intelligence studies, if human intelligence and learning phenomena are understood and defined in the finest detail, machines will be able to imitate this situation and have the ability to learn and have intelligence (Ghasemaghaei, Calic, 2020).

The first important studies on human intelligence began in 1905 when Binet and Simon developed the first intelligence test. The intelligence test developed by Binet and Simon as part of a project initiated by the French Ministry of Education for the placement of children who would start school in Paris into classrooms made a great impact and a short time after its development, an English version was prepared and started to be used in schools in America. With the entry of America into World War I against Germany in 1917, intelligence tests were also used extensively in the selection and classification of soldiers for the army. With the development of the first intelligence test and the understanding of the importance of intelligence, the interest of many researchers turned to this field and many intelligence definitions were made and different intelligence theories were developed. Binet, one of the scientists who developed the first intelligence test, defined intelligence in terms of memory capacity, the sharpness of sensory organs and reaction speed. Piaget, who explained intelligence with characteristics such as reasoning, reversibility and the ability to use language, said; He defined it as a structure that develops depending on the variety of stimuli acquired from the environment rather than a hereditary structure and as the ability to adapt to the environment. Spearman developed a two-factor theory of intelligence that he called general (g) and special (s) ability areas. As it is understood from the theories of intelligence and the definitions of the researchers, an intelligence theory that all researchers agree on has not been developed yet. Cem Say, who has studies on artificial intelligence, likened the human brain to a superior computer that processes information. According to him, the biggest difference between the human brain and the computer is that while a process is performed in a computer, each processor must wait for the completion of the previous process, in the human brain this process can be done by billions of neurons at the same time. While scientists have been trying to develop machines that behave like humans since the past, they have also tried to understand human characteristics. Therefore, artificial intelligence studies and human intelligence studies are studies that should be considered together and complement each other. When people aim to develop machines with artificial intelligence, do they expect the machines they develop to act intelligently or smartly? While the mind is defined as the ability of a person to distinguish between right and wrong, intelligence is defined as the ability of people to understand the events they encounter and to produce solutions. The most important indicator of human intelligence is the ability to learn. Therefore, the basis of artificial intelligence systems that are tried to be created by taking human intelligence as an example is the idea of providing machines with the ability to learn. The most important feature of artificial intelligence is that it can use what it has learned very quickly and acquire permanent learning. Learning skills have been imparted to

artificial intelligence systems through statistics, mathematics and data science. Machines can acquire the learning that humans can only acquire through life experience and interaction much faster as a result of statistical analysis of data obtained from millions of people (Jöhnk, Weißert, Wyrtki, 2021).

Artificial intelligence is a field of study that emerged by trying to imitate human intelligence. However, what artificial intelligence can do is limited to the biologically observable characteristics of human intelligence. Since human intelligence cannot be fully explained, a definitive and unchangeable definition of intelligence has not been made. Therefore, artificial intelligence systems that can represent human intelligence as a whole have not been created. Machines using artificial intelligence are called intelligent machines or non-intelligent machines according to some of the features they display. Although the concrete development of artificial intelligence systems has a recent past, some components of intelligence have been successfully modeled. However, no system developed yet has been able to simulate the features of human intelligence such as creativity, imagination, and originality. Thanks to today's artificial intelligence studies, features of human intelligence such as definition, classification, discrimination, problem solving, calculation, and decision making have been transferred to machines. However, it is seen that many other features of human intelligence have yet to be excluded in artificial intelligence studies. A being with real intelligence must have all the intelligence features that can be considered good or bad according to universal acceptance. Humans are not just creatures consisting of logical thoughts. The human effect and reason are intertwined with emotions in a way that cannot be fully explained. Based on the "human-like" discourse, emotional states should also be added to the systems to be created in order to develop artificial intelligence. For example; the emotion of fear is a system that protects people from taking precautions against external dangers, while the emotion of disgust is a system that keeps them away from poisonous food. Emotions can be added to artificial intelligence systems through learning, but this is not necessary. On the other hand; it is a controversial issue that researchers working on human intelligence cannot agree on whether emotions represent intelligence (Mikalef, Krogstie, Pappas, 2021).

It has been argued that motivation, stress, self-confidence and all similar emotions are effective on success, but when they come together, they do not indicate a meaningful structure and therefore cannot form a theory of intelligence. While there is no consensus on the place of emotions in the definition of human intelligence, stating that artificial intelligence systems do not represent intelligence because they lack emotions will not be anything more than another uncertainty.

However, not all human characteristics can be concretely stated and defined. Some characteristics can only be known through the field of metaphysics. In addition, in order for systems created with artificial intelligence to be considered intelligent, they must have a body, emotions, abilities, senses, memories, cultural interaction and imagination like humans.

In the 20th century, researchers working in the field of artificial intelligence abandoned the goal of producing human-like systems adopted in the classical tradition and turned to the goal of creating solution-oriented systems. Artificial intelligence studies have reduced human intelligence to a cognitive formalism such as logic and reasoning. Artificial intelligence studies are the product of human beings' efforts to create systems that are as intelligent as themselves or more intelligent than themselves. However, today's artificial intelligence studies have transformed in line with this first goal and are divided into different fields of study under the field of artificial intelligence. The sub-branches of the field of artificial intelligence are machine learning, artificial neural networks, natural language processing, speech synthesis, speech understanding, expert systems, knowledge base and fuzzy logic. In today's artificial intelligence studies, the principle of imitating human intelligence has expanded and evolved towards imitating other living things. In recent studies, artificial intelligence systems have been developed that imitate the behavior of living things living in flocks such as ants, birds, bees and fish. The issue of evaluating artificial intelligence systems has been on the agenda since the beginning of concrete studies on artificial intelligence. The first person to propose a test for this was none other than Alan Turing.

In his article titled "Computing Machinery and Intelligence", Alan Turing put forward the idea that machines with intelligence could be built and designed the application known today as the Turing

Test, originally called the "Imitation Game", to understand whether a machine has intelligence. The Turing Test is applied as follows: A machine with artificial intelligence and a real person are in one room, and another person in the position of interrogator is in another room. If the interrogator does not understand that the artificial intelligence is a machine as a result of the mutual conversations (dialogues), the developed artificial intelligence system is considered to have real intelligence. Today, the Turing Test is still seen as a difficult threshold for artificial intelligence systems. The Dangers and Benefits of Artificial Intelligence for Humanity When Alan Turing's article titled "Computing Machinery and Intelligence" is taken as a starting point, artificial intelligence systems, which have a short history of approximately 70 years, have experienced great developments especially in the last 20 years (Wamba-Taguimdje, Fosso Wamba, Kala Kamdjoug, Tchatchouang Wanko, 2020). Artificial intelligence systems have simplified many situations that were difficult for people in the past for today's people and provided unimaginable advantages. Many artificial intelligence products such as artificial intelligence systems that determine the most suitable route to use to find any address, applications that create a personal recommendation list for shopping and offer the most suitable products, and artificial intelligence-based driverless vehicles that minimize the risk of accidents on highways provide great advantages to people in terms of time, labor, cost, and workforce. On the other hand, since the early days of the idea of artificial intelligence, the idea that these systems could one day get out of control and lead to the end of humanity has also come with it. Whether artificial intelligence has a limit and whether it will pose a danger to humanity has always been a matter of debate. However, there is no need to worry. Because computer science is structured by modeling the questions of "what" and "how". In order for artificial intelligence to escape human control, computer science needs to model the question of "why". In addition, humans are not just about intelligence. Humans have "consciousness" and "will". Therefore, in order for artificial intelligence to compete with the human brain, it needs to have an artificial consciousness and will (Dwivedi, Hughes, Ismagilova, Aarts, Coombs, Crick, Williams, 2021).

Systems based on artificial intelligence are developing and being transformed into higher systems through their interactions with humans. However, it is also possible for these systems, which provide great benefits for humanity, to be transformed into systems hostile to humans by human hands. A social experiment was organized on Twitter with a chatbot named "Tay", an artificial intelligence application developed by Microsoft. However, the experiment had to be stopped at the end of sixteen hours due to the hateful, racist, bigoted and immoral statements of the artificial intelligence application named Tay. Therefore, as with all technological developments, it is in the hands of humanity to use artificial intelligence systems for the benefit or harm of humanity. Artificial Intelligence and Education According to Edward Fredkin, director of the Artificial Intelligence Laboratory at the Massachusetts Institute of Technology (MIT) and a faculty member at Carnegie Mellon University, there are three important events that have occurred throughout history. The first of these is the formation of the universe, and the second is the beginning of life. The third and another event that he considers equally important to the beginning of life is the emergence of artificial intelligence. With the development of artificial intelligence, there have been changes in the areas and roles required for humans. In the beginning of life, humans needed hunting and gathering to survive, but today, in order to survive, they are expected to have the ability to work in harmony with machines with artificial intelligence, to use and develop artificial intelligence systems. With the inclusion of machines with artificial intelligence in business lines, the need for physical strength and simple cognitive skills expected from humans has decreased. The spread of systems based on artificial intelligence has brought with it fears that they will replace humans and make people unemployed. However, the decrease in the need for some professions should not mean that people will be unemployed. With the spread of artificial intelligence, some professions are losing their importance, while new professions are emerging in some areas (Mikalef, Krogstie, Pappas, 2021). Professional fields that were unheard of until recently, such as social media expertise, IT lawyer, IT prosecutor, are becoming popular. Many professions are changing rather than disappearing with artificial intelligence systems. While artificial intelligence systems reduce the importance of cheap human-based labor, they increase the need for qualified human power that can work with artificial

intelligence systems. The development and spread of artificial intelligence systems affects every segment of society, from the education system to the business world, from managers to employees. The quality of the workforce required today may soon become unnecessary. Therefore, states need to take artificial intelligence systems into account when organizing their development plans and education systems. Even if states do not use artificial intelligence systems within their own institutions, they are affected by the increasingly widespread artificial intelligence systems. The USA, Russia, China and European countries, which are pioneers in the development of artificial intelligence systems, are making major investments in the field of artificial intelligence (Haenlein, Kaplan, Tan, Tan, Zhang, 2022).

The Organization for Economic Co-operation and Development (OECD) has added the measurement of features such as digital literacy skills, digital citizenship, information fluency, technological literacy, creativity, innovative thinking, critical thinking, solution generation, and decision-making, which have gained importance with the development of artificial intelligence systems, to the Programme for International Student Assessment (PISA). The success obtained from paper-and-pencil tests, which have a very important place in the classical education system, is being replaced by success obtained in the virtual environment. In the transforming education system, individuals need to understand, analyze, manage, transform information or synthesize new information in the virtual environment rather than in the real world. At this point, many cognitive features of human intelligence have been successfully created on artificial intelligence systems. However, artificial intelligence systems have not yet achieved the desired success in many other features of human intelligence such as creative thinking, creating original products, synthesizing new information, evaluating, creating visual artwork, imagining, and critical thinking. Education systems are also affected by this benefit of artificial intelligence and are evolving towards raising individuals with high imagination and creativity instead of raising monotonous and robotized human types. While professions that have certain patterns and do not require creativity are easily replaced by artificial intelligence systems, it is predicted that professions that require imagination and artistic features will be carried out by humans for a longer period of time. The development of systems based on artificial intelligence has not only changed the human profile that education systems are expected to raise, but also changed the structure and functioning of education. Today, thanks to artificial intelligence applications, personalized education programs, individual performance monitoring, course content preparation, and determination of teaching models have increased the quality of education by using large data sources. With the development of artificial intelligence and technology, it has become possible to continue education independently of time and space. In addition, with the integration of artificial intelligence with education systems, options such as free choice (flexible service), personalized learning, and project-based learning have been included in education. Today, it is seen that artificial intelligence systems are mostly used in the fields of distance education, online learning (e-learning), virtual reality, and augmented reality (Mikalef, Krogstie, Pappas, 2021).

With artificial intelligence systems, there have been changes in both the type of people the education system is expected to train and the way education operates. With this change, the most important segment that needs to adapt to the new educational goals and operating methods is educators. All stakeholders working in the education system, especially school administrators, branch teachers, and classroom teachers, need to have the skills to use artificial intelligence systems and work in harmony with artificial intelligence systems (Ghasemaghaei, Calic, 2020). Especially in the pandemic conditions that all countries of the world have had to deal with in the last two years; the problems experienced in compulsory distance education have shown that educational technologies and artificial intelligence should be used effectively and that artificial intelligence can be used functionally in solving the problems experienced. It is foreseen that artificial intelligence studies will increase even more after this period and will be widely used in solving the problems to be experienced in education. Indeed, there has been an increase in the number of studies and publications on the use of artificial intelligence systems in education in the recent period. Under the title of "what should be taught to students", it has been emphasized that teaching only information with artificial intelligence and the technologies it brings is no longer of much importance, and instead, a more integrative

perspective should be gained. In the "how to teach students" section, the indirect and direct effects of artificial intelligence systems as an aid to teaching are discussed. While teachers in traditional classrooms cannot deal with each student individually and completely eliminate their learning deficiencies, students' learning deficiencies can be minimized thanks to personalized educational content. Since artificial intelligence systems used in education analyze big data obtained from students, they can provide more detailed results than classical evaluation methods. While the use of artificial intelligence-based systems provides many advantages in terms of the quality of education, a system where teachers are out of the picture and only based on artificial intelligence will not be functional. Because although artificial intelligence systems act as personal teachers, they can sometimes give wrong results for more specific situations since they are based on big data analysis. Artificial intelligence systems used in education can be generally classified as expert systems, intelligent tutoring systems and dialogue-based systems. Expert systems can be defined in the simplest form as systems that have only knowledge of that field, like a person who is specialized in any field. These systems are mostly used in distance education. Intelligent tutoring systems can be defined as an improved model of expert systems and computer-aided teaching systems. Intelligent tutoring systems offer students personalized learning environments (Marabelli, Newell, 2022). Dialogue-based systems, on the other hand, continue to provide individuals with personal training programs, as well as correcting learning deficiencies through dialogues and organizing the training program according to the learner. Although artificial intelligence systems used in education are tried to be classified under as many subheadings as possible, since the development of artificial intelligence is very rapid, many new subfields are added day by day. The most widely known of these can be listed as artificial neural networks, computer vision, robotics, genetic algorithms, chaotic modeling, and simulated annealing. Due to the Coronavirus outbreak that has affected the world, the use of artificial intelligence-based systems in education has become a necessity rather than a choice. In the process that started with the World Health Organization (WHO) declaring the Coronavirus outbreak a "pandemic" on March 11, 2020, workplaces have been closed in many countries around the world, tourism, art, culture and education activities have been stopped, curfews and social distancing rules have been implemented. In the last two years, many countries, institutions and millions of people have suffered greatly from this process. It is clear that disruptions, especially in the field of education and training, will cause long-term problems for future generations. Therefore, the inclusion of artificial intelligence applications in the education process has become of vital importance in this period. Online education courses based on artificial intelligence systems were organized by using data mining and student analytics based on student information in education and attempts were made to prevent disruptions in education and training activities. Applications such as Questa, Cognii and Kitaptive were used to provide data for the establishment of artificial intelligence systems and artificial intelligence-supported education platforms such as Knewton, Century Tech, Voleybolu and Querium were created (Jöhnk, Weißert, Wyrtki, 2021).

Conclusion

As a result, since artificial intelligence systems are developing and spreading very rapidly today, it is clear that standing against artificial intelligence will be an unnecessary endeavor at this point. Instead of competing with artificial intelligence systems, people should focus on developing their skills in using and managing them. From the smallest units of states to the highest units, from the oldest individuals of society to the youngest individuals, they need to be trained so that they can understand and adapt to artificial intelligence systems. In addition, establishing control and audit mechanisms to prevent the misuse of artificial intelligence systems will be beneficial in terms of carrying out the studies more healthily. In addition to all these, the use of artificial intelligence, especially in the field of education, will provide practicality and make important contributions in many areas. The effects of artificial intelligence systems on all scientific fields and society can only be adapted with the education system. On the other hand, the education system also benefits from artificial intelligence systems while preparing individuals for the change created by artificial

intelligence. Especially in recent times, with the spread of epidemics and disasters that pose a great threat to humanity, it has become even more important to place education systems on the axis of artificial intelligence. As long as artificial intelligence systems are used for the right purposes, they will ensure positive transformations for humanity and contribute to its development. For this purpose, scientists from all disciplines, especially educational scientists who make the greatest contribution to the change and awareness of society, need to contribute to the studies in this field (Wamba-Taguimdje, Fosso Wamba, Kala Kamdjoug, Tchatchouang Wanko, 2020).

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