REVIEW

Artificial intelligence as a tool for knowledge management

Dragan D. Obradovic[1], Nebojsa Denic[2], Goran Nestorovic[3] and Dragisa V. Obradovic[4*]

[1]Mathematics and Informatics Department, Elementary School "Kralj Aleksandar", Pozarevac, Serbia
[2]Faculty of Science and Mathematics, Department of Informatics, Kosovska Mitrovica, Serbia
[3]Department of Applied Engineering Science, Academy of Technical Vocational Studies, Belgrade, Serbia
[4]Faculty of Management, Association of Engineers and Technicians - HTM, Pozarevac, Serbia

*Correspondence:
Dragisa V. Obradovic,
dragishaobradovic@yahoo.com

Information and communication technologies and knowledge management represent one of the basic features of modern society. The needs of modern society and economy for better and more efficient products and services condition the constant development of the technological sector. One of the latest and most significant phenomena in the field of technology is artificial intelligence (AI), that is, the possibility of computer programs to replace human intelligence and human work in many activities and activities. The goal of the paper is to point out the importance of future research on AI in various areas of law, for which the need will inevitably arise in the near future.

Keywords: artificial intelligence, knowledge management, information technologies, new technologies, competitive advantage, knowledge as a key resource, knowledge life cycle, education

Introduction

Technology and science represent the basic determinants of modern society that influence its nature and the way social relations unfold. Inventions in the field of science and technology change the concept of modern life, influence the perceptions of man and his activities, and change the moral and legal environment within which society develops and functions. Science and technology have opened wide the door to new systems that are used in the daily life of citizens, business entities, and the functioning of government bodies. Artificial intelligence (AI) stands out as one of the most significant new digital phenomena.[1] In short, AI is a general name for advanced computer systems that strive to simulate the functioning of human intelligence in such a way that machines are capable of replacing the role and work of humans in various activities, from simple to complex (1, 2). Their work is based on previously entered parameters, that is, information that represents the basic elements on which the development of the entire science and technology is based. As computer systems are capable of processing large amounts of information and data, the potential of AI is huge, since many jobs can be done faster, more efficiently, and more successfully using it. This applies to various mathematical and economic calculations, database searches, transport and sales services, providing medical assistance, etc.

Knowledge management

Knowledge represents the totality of everything known in a certain field, facts and information, and awareness or

---

[1] The technology-oriented principle aims to follow all trends in the development of artificial intelligence in the world, to enable long-term support for entities working on its development, and to focus on understanding new theories and opportunities in this sector. The system setting means that the development of artificial intelligence will be based on basic research, industrial and technological inventions, and application possibilities. Special attention is focused on the application of such knowledge and methods in the socialist social system. Orientation towards the market is a principle that speaks of the need for cooperation between authorities and business entities in order to promote new achievements, regulate the market, and take account of ethical norms and the environment.

Thanks to open access, it will be possible for interested subjects to freely access data related to artificial intelligence and to share and use it for the purpose of developing their products, research, and innovation.

familiarity acquired through the experience of a fact or situation.[2] Knowledge is a system or logical overview of facts and generalizations about objective reality that man has adopted and permanently retained in his consciousness. Knowledge also consists of all the facts, information, and skills that a person has acquired through experience or education (3–6). It is a theoretical or practical understanding of a subject. Nowadays, knowledge plays an increasingly important role in success, both in life and in business. In production technologies and products, the amount of knowledge and information is increasing significantly. In the most developed parts of the world, more than half of the gross domestic product is based on knowledge, which is a clear example of the direction in which we should direct our economy. Knowledge is also the ability of people to use information to solve complex problems and adapt to change.[3] It is the individual ability to master the unknown, which is very important in the economy. Business brings us new obstacles and ups and downs every day, and we will only achieve success if we have enough knowledge and persistence to overcome these obstacles and solve problems. Because of such situations, a new discipline was born that deals with exactly that, namely knowledge management. The changes that the new knowledge economy introduced in business organizations in the past few years, including changes in the organizational structure, organizational culture, business routines, internal and external communication, etc., also influenced the development of new theories of the company.

However, in order for an organization to be successful in the knowledge economy and realize its competitive advantage, it needs to constantly increase its value with the knowledge it possesses. The potential for creating additional value that each organization possesses in the knowledge economy depends on two essential elements: the level of services provided by the organization and the intensity of use of the organization's knowledge and the

level to which the organization uses knowledge to produce a product or provide services. Therefore, the most important factor in the acquisition, creation, and sustainability of the competitive advantage of any organization is the degree of knowledge use and knowledge management. Knowledge provides the basis for a strategic plan of action and introduces us to the area where strategic changes can provide the greatest profitability, the area of knowledge management.[4]

Organizations today cannot achieve competitive advantage and further development without knowledge, i.e., knowledge management. The ability of an organization to learn and change, to learn faster than others, and to quickly turn what has been learned into action is the greatest advantage it can possess. The ability to manage knowledge is becoming increasingly important in today's so-called knowledge economy (**Figure 1**). The creation and dissemination of knowledge within a modern organization is increasingly becoming a decisive factor in achieving and maintaining its competitive advantage. In fact, the only sustainable advantage of a modern organization comes from what a firm knows, how effectively it uses what it knows, and how quickly it acquires and uses new knowledge. A modern organization in the era of knowledge is one that learns, remembers, and acts on the basis of information and knowledge available in the best possible way (Porter, 2007). Achieving a sustainable competitive advantage is possible only if firms perform activities differently from their rivals or perform similar activities but in a much better way. For that they need knowledge. Knowledge is inextricably linked to the application and implementation of problem-solving skills in organizations. It directly affects the management's ability to perceive complex organizational problems and to try to solve them. Knowledge implies the accumulation of information and the mindset in which information is organized.

---

[2] Knowledge management is a method that should be used to simplify and improve the process of creating, exchanging, distributing, recording, and understanding knowledge in the company.
[3] Knowledge management processes include knowledge identification, creation, acquisition, transfer, sharing, and exploitation of knowledge.

---

[4] Knowledge management is a set of procedures on the generation, communication, transformation, and application of knowledge so that it is sufficient to justify the actions taken and placed in the contexts in which individuals and organizations can find them.
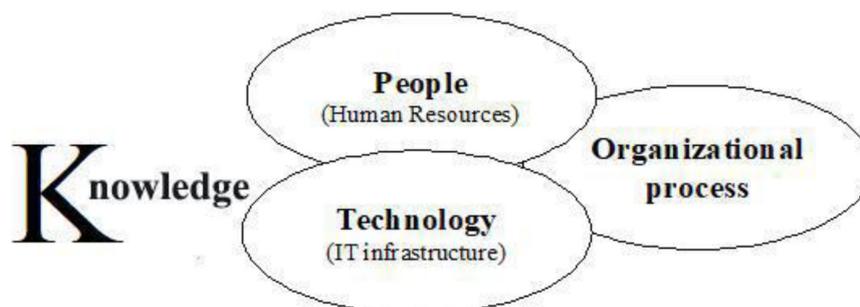

FIGURE 1 | Knowledge management.

Knowledge as a key resource

In many companies, knowledge is increasingly considered a very important resource. Better use of knowledge than exists in many places in the company can lead to more significant changes, i.e., to a significant increase in productivity, and then the qualities (7, 8). If the managers of a company knew what their company knows, they could fulfill the wishes of their clients to a greater extent, they could offer more innovative products, and they could react more quickly to the changes in the market with which they are dealing and encounter every day, and also increase the productivity of the company itself. With the desire to quickly become better, companies focus on increasing efficiency while the fundamental parameters of competitiveness change little or not at all. Therefore, guidance for knowledge-oriented companies doesn't just mean getting better faster, but also slowly becoming different, and slowly because that sometimes means, for example, a transformation towards the new innovation culture of the company, which in turn is the result of a complex process that has to be initiated, shaped, and unfolded over a longer period, while being different due to the fact that as the result of a change in the company's culture due to a new configuration of its resources or in general, it cannot imitate (9).

Running a company oriented towards knowledge means applying knowledge resources in order to increase efficiency on the one hand and the quality of the competition on the other. The goal of such a knowledge-oriented company is to create knowledge from information and turn it into permanent competitive advantages that are then reflected through business successes. The growing importance of knowledge as a resource can be reduced to three driving forces that are mutually conditioned, and according to Picot (1996), they are structural transformation into an information and knowledge society, globalization, and information and communication technology

The first mentioned driving force is structural transformation. Under structural transformation we mean the transformation from labor- and capital-intensive activities to activities based on information and knowledge. This would mean that companies, in all, to a greater extent, sell information, knowledge, or intelligent products and services. It's here; it is clear that labor and capital replace knowledge as a scarce resource and that structural transformation leads to changes in the form of companies as well as transformations within and between companies and to a new understanding of the role of managers and associates.

Another driving force is the globalization of the changing economy and the international division of labor. Thus, the countries that today are called industrial nations become nations of knowledge. Physical production is increasingly taking place in underdeveloped and developing countries, and international learning processes accelerate so that new

competitors can penetrate the world market in very short intervals. Information and communication are mentioned as the third driving force technologies that enable, and also speed up, transactions and create global transparency of information. It is clear that this results in numerous changes to the market and faster innovations that are reflected in lower prices and a shorter life cycle of products; the personalization of clients' needs become prominent with the the emergence of new business fields.

Life cycle of knowledge management

The knowledge management process, i.e., the life cycle of knowledge, is usually divided into subprocesses, which are interconnected. Depending on the literature by authors, there are several divisions, which consist of a different number of sub-processes. Therefore, the approaches can be three to eight different sub-processes. It's mostly about the same subprocesses, only in some approaches, individual activities stand alone, while in others they are combined in someone else. In this paper, a cycle with four sub-processes will be represented:

1. Acquiring and creating knowledge,
2. Storing and preserving knowledge,
3. Transferring and sharing of knowledge,
4. Use and application of knowledge.

Acquiring and creating knowledge is the process by which the company creates, systematizes, organizes, and increases its knowledge; stores it; combines it; and uses it permanently for the creation and application of new knowledge, effectively using the individual knowledge of its employees and all other internal and external sources available to it. In simpler terms, it is the process by which a company creates new knowledge, spreads it, and incorporates it into products and services.[5] Through this process, the company actually creates its own network, that is, the knowledge base, and turns knowledge into organizational capital (10).

The basis of this process is the transformation of tacit knowledge into explicit knowledge, i.e., creating new knowledge from existing knowledge. Existing knowledge resides in the minds of individuals, so it can be said that the creation of knowledge always begins with the individul Making personal knowledge in an organizational form constitutes the essence of knowledge management. It is important to pay attention so that the company does not

---

[5] Knowledge transfer represents an extremely important stage of the knowledge management process. If a suitable way is not found to transfer the available knowledge to the users or to accept the necessary knowledge from those who possess it, there will be no application of the knowledge, so there is no benefit from knowledge management.

ends up in "overdose of information," so a central database is needed to carefully organize, maintain, and update.

When creating a knowledge base, companies can use in-house knowledge and also use external knowledge. This is knowledge that does not exist within the company, but it is available from its environment from customers, suppliers, competitors (benchmarking), consultants, and educational and state institutions. The company should actually use all knowledge available to him, regardless of its origin. That's the best way to use is potential for commercial purposes.[6]

Storing and preserving knowledge implies a process in which knowledge is stored in the company in some form and on some medium. That's how knowledge can be transferred within the company; multiple use, combining or using it for creating new knowledge. In order for knowledge to be stored and preserved, it first needs to be codified, and it is a process that is important to do at an early stage. Encoding knowledge is the process of turning knowledge into messages, which can be processed as if they were information.

The problem arises when codifying tacit knowledge. That it could be done to codify, it is necessary to turn it into an explicit one, which is a demanding process and very often impossible. Therefore, some authors state that the codification of tacit knowledge is actually reduced on finding the person who has that knowledge and referring the person to whom that knowledge is necessary for. Explicit knowledge is simply encoded by creating manuals, internet documents, procedures, and the like. Codification can be implemented using different techniques such as cognitive maps, decision trees, analysis tasks, and others. Codification needs to be approached carefully in order to access knowledge simple and efficient to access and so that new knowledge can be generated.

The process of codification results in the fact that part of the knowledge is lost, but it is still an indispensable process without which it is not possible to store and share knowledge. The result of storing and saving knowledge is the basis of organizational knowledge. It should be managed well and regularly updated so that it is adequate for use. Transferring and sharing knowledge is the most important part of the knowledge management process. That is also a consensual process because it requires more voluntary readiness and cooperation from a person. By transferring knowledge through the company, all employees can access and use previously codified and stored knowledge. There are two ways of imparting knowledge—searching for knowledge in literature or the Internet and contacting a person who knows.

Contacts with a person who knows can be either a personal conversation or a collective interaction, through

project teams or group studies. Some companies' employees undertake to transfer knowledge, including mentoring and teaching. For that purpose it is also necessary to provide systems that will enable simple communication and thus knowledge sharing. The combination of such initiatives and the organizational culture of sharing that it fosters are the main factors that support the distribution of knowledge.

The use and application of knowledge is the last stage and goal of knowledge management (11). All the collected, stored, and distributed knowledge is used in the company and in this way increases its efficiency and competitive advantage. Ability to use knowledge—in fact, it is the most important ability of modern companies. Application of knowledge should be systematically encouraged and organized and ensure the conditions for continuous development. Development of knowledge management system requires large financial resources, and therefore knowledge should be used intensively so that the investment is profitable. If the knowledge is not used, it is meaningless and does not create value.

Connection and division of work on AI

Artificial intelligence already has a direct impact on the economy, politics, education, culture, democracy, and human rights. We can only guess what impact AI will have on our lives in the future. Its development and entry into our everyday life today opens up a series of new issues: from the issue of legal subjectivity and responsibility of robots with AI to the issue of threats to human rights and democracy by AI systems. The number of human rights that are threatened due to the development and application of AI is increasing day by day.

Artificial intelligence technologies nowadays are increasingly present in various fields, bringing a large number of benefits. In its beginnings, AI was conceived as a replacement for experts in certain fields (medicine, informatics, and finance) in order to progress so that it can now offer great opportunities for improving people's quality of life (10). In some perspectives, for certain jobs, where automated AI systems will perform them better than humans, there will no longer be a need to engage the human factor, but on the other hand, there will be a need for the human factor in the new areas that automation brings (controlling, management, etc.). Automation in combination with AI is extremely important because in this way the scope and type of tasks can be expanded. Robotic automation is actually a type of program that automates repetitive rule-based processing tasks traditionally performed by humans. Machine learning is the science of how a computer works, improving its performance on a specific task without additional programming. In the

---

[6] Knowledge transfer, as a phase or sub-process of knowledge management, is seen here as a complex process that includes the exchange and sharing of knowledge between individuals and organizations, and also the transfer of knowledge from those who possess it to those who want to receive that knowledge and use it.

literature, it is often confused with deep learning and data mining. Deep learning is actually a subset of machine learning, which can be considered the automation of predictive analytics, followed by appropriate training system architectures, such as deep neural networks. Data mining is a subset of the data science process and refers to the exploration of an existing large data set in order to discover previously unknown patterns, relationships, and deviations present in the data. Machine learning is a subset of data mining. With this process, computers analyze large data sets and then learn patterns that will help them predict new data sets. Apart from initial programming and fine-tuning, the computer does not need human interaction to learn patterns. It can also be interpreted as an analytical process useful for predicting outcomes.

With advances in machine learning, big data, AI, and other technologies, a new generation of intelligent robots has emerged that can perform routine, repetitive, and regular manufacturing tasks that require human judgment, problem-solving, and analytical skills. Robotic process automation technology can learn and mimic the way workers perform repetitive new tasks related to data collection, reporting, data copying, data integrity checking, reading, processing, and emailing, and can play an essential role in processing large amounts of data. In the context of an information technology (IT)- and technology-oriented economy, companies are asking employees to move into creative jobs. According to the combined task framework theory, the most significant advantage of the productivity effect produced by intelligent technology is the creation of new demands, that is, the creation of new tasks. These new quest packs update existing quests and create new quest combinations with more complex technical difficulty. Although intelligent technology is widely used in various industries, it can have a substitution effect on workers and lead to technical unemployment. However, with the rise of a new round of technological innovation and revolution, high efficiency leads to the development and growth of a number of emerging industries and has job creation effects. Technological progress affects the creation of new jobs. That is, such progress creates new jobs that are more in line with the needs of social development and therefore increases the demand for labor. Therefore, the intelligent development of enterprises will come to replace their initial programmed tasks and produce more complex new tasks, and human workers in non-programmed positions, such as technology and knowledge, will have more comparative advantages.

Application of artificial intelligence

Artificial intelligence is increasingly used in science and education, where it is claimed that it can contribute to

scientific solutions and individualized learning programs.[7] On the other hand, there are various normative dilemmas surrounding its use. For example, the question arises under which conditions we are allowed to apply algorithms and collect data from students who are minors or what long-term consequences the application of AI in education may have on them.

Application of educational technologies plays a key role in providing new and innovative forms of support to teachers, students, and the learning process itself. The digitization of all segments of society and the increasing demands for a highly qualified workforce increasingly require support in education. Determining the best tools to support learning and increase the efficiency of education systems is critical to that effort. The popularity of the Internet and IT has provided a platform for universities not only to deliver information directly to their students but also to establish two-way communication.

Artificial intelligence is broadly referred to as the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions (10). It is applied when referring to machines that exhibit characteristics associated with the human mind. The recent emergence and growth of AI in academia represents an opportunity, as well as a threat, for various domains of science. While some predict that the application of AI through robotics could lead to technological unemployment, it has allowed the science to expand into previously unexplored areas and provided ease of execution, for example, in medical diagnostics. In order to efficiently program machines for desired tasks, AI methods require large repositories of data. Algorithms used in AI methods need large training data sets to facilitate decision support by improving early detection and thus improving decision-making. The data acquisition process in a non-destructive phenomenon involves the integration of data from instruments/sensors (i.e., digital cameras and spectrometers), usually equipped with their own individual, proprietary communication protocols, into AI algorithms. Sensor outputs often require conversion to compatible digital formats before analysis. The management of phenomic data thus includes three critical components in which AI is applied: algorithms and programs to convert sensory data into phenotypic information; development of models for understanding genotype-phenotype relationships with environmental interactions; and database management to enable sharing of information and resources. The main aspects of AI, machine learning, deep learning,

---

[7] The main effects of using artificial intelligence in production management include increased productivity and reduced costs, improved product quality while reducing losses, faster response to market and customer needs, improved inventory and logistics management, reduced manual labor in risky or repetitive tasks, and reduced environmental impact of production.

and computer vision have been applied to a recognizable extent in phenomena.

Conclusion

Artificial intelligence brings with it many benefits to traditional social concepts by helping in the efficiency and success of many business and private activities, faster and better than a human can do. The fields of application of AI are numerous and include important sectors such as agriculture, transport, hospitality, tourism, health, sports, art, etc. Bearing in mind that AI directly affects the lives of citizens and the functioning of society, legal systems and legal science should not remain silent on its appearance and the increasing use of new technologies in everyday social and business activities.

The extremely dynamic development of technologies today places high demands on the legal system, which should regulate the new reality based on algorithms. It is necessary to quickly adapt legal norms and areas that open a number of new doubts and questions: autonomous behavior of AI systems, legal subjectivity of AI, responsibility for damage caused by AI systems, new professional and ethical standards, etc. Due to the extreme complexity and speed of changes, a clear regulatory framework must be based on the co-regulatory principle of binding general instruments and non-binding detailed sectoral instruments.

Artificial intelligence systems should be designed to guarantee privacy and data protection. To this end, AI developers should implement design techniques such as data encryption and data anonymization. Moreover, they should ensure the quality of the data, i.e., avoid socially constructed bias, inaccuracies, and errors. To this end, data collection should not be biased, and AI developers should establish mechanisms for monitoring and quality control of data sets.

Knowledge represents the totality of everything known in a certain field, facts and information, and awareness or familiarity acquired through the experience of a fact or situation. Knowledge is a system or logical overview of facts and generalizations about objective reality that man has adopted and permanently retained in his consciousness. Knowledge also consists of all the facts, information, and skills that a person has acquired through experience or education. It is a theoretical or practical understanding of a subject. Nowadays, knowledge plays an increasingly important role in success, both in life and in business.

In production technologies and products, the amount of knowledge and information is increasing significantly.

Funding

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Pospelova DA editor. *Artificial Intelligence: A Textbook: In Three Books. Vol. 2: Models and Methods*. Moscow: Radio and Communications (1990).

2. Bondarev VN, Ade FG. *Artificial Intelligence: A Textbook for Universities*. Sevastopol: Publishing house SevNTU (2002). 615 p.

3. Al-Emran M, Mezhuyev V, Kamaludin A, Shaalan K. The influence of the knowledge management process on information systems: a systematic review. *Int J Inf Manag.* (2018) 43:173–87.

4. Salum SA, Al-Emran M, Shaalan K. The influence of knowledge exchange on information systems: a review. *International Conference on Knowledge Management in Organizations*. Berlin/Heidelberg, Germany: Springer (2018).

5. Santoro G, Vrontis D, Trasu A, Desi L. The internet of things: building a knowledge management system for open innovation and knowledge management capacities. *Technol Forecast Soc Change.* (2018) 136: 347–54.

6. Liebowitz J. Knowledge management and its connection to artificial intelligence. *Expert Syst Appl.* (2001) 20:1–6.

7. Li J-K, Shiue J-K, Chen K-J. Examining the impact of organizational culture and top management support for knowledge sharing on the success of software process improvement. *Comput Hum Behavior.* (2016) 54:462–74.

8. Al-Emran M, Teo T. Do knowledge acquisition and knowledge sharing really influence e-learning adoption? An empirical study. *Educ Inf Technol.* (2020) 25:1983–98.

9. Al-Emran M, Mezhujev V, Kamaludin A. An innovative approach to knowledge management in mobile learning application development: a pilot study. *Int J Inf Commun Technol Educ.* (2019) 15:94–112.

10. Metaxiotis K, Ergazakis K, Samouilidis E, Psaras J. Decision support through knowledge management: The role of artificial intelligence. *Inf Manag Comput Secur.* (2003) 11:216–21.

11. Swan J, Newell S, Scarborough H, Hyslop D. Knowledge management and innovation: networks and networking. *J Know Manag.* (1999) 3(4):262–75.