KNOWLEDGE MANAGEMENT IN DISRUPTIVE TIMES

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Abstract: *In the era of big data and fast changing markets, timely information and knowledge for making business decisions make a competitive advantage. Rapid changes cause disruption of organizations, especially new information technologies and organizations that are born digital. To cope, many organizations undergo digital transformation and change their business models. In such conditions, knowledge management is more important than ever, but the question is whether companies recognize its large potentials, from supporting digital business and digital workforce to preserving and delivering critical knowledge at any time. In this paper we discuss benefits that knowledge management can give organizations in disruptive times together with issues and challenges that arise. Also, an overview of new information technologies that may be incorporated into knowledge management systems and contribute to those benefits is presented, such as technologies connected to artificial intelligence. This leads to examination how disruptive times and technologies change knowledge management itself and whether and how they affect processes of creating, managing, sharing and using organizational knowledge.*

Keywords: *knowledge management, information technology, organization disruption, disruptive technology, disruptive times.*

1. INTRODUCTION

Many factors influence success of an organization on the market that is constantly changing. Business decisions should be made according to timely information and knowledge, because they minimize the risk and uncertainty. One of important factors to consider is disruption of organization. According to Cambridge Dictionary [1] verb *to disrupt* means "to prevent something, especially a system, process, or event, from continuing as usual or as expected" and its special meaning in business is "to change the traditional way that an industry operates, especially in a new and effective way". There are many ways in which disruption can occur, but today is frequently caused by new emerging technologies that change how the business processes are conducted.

To be successful in continuous environmental changes and possible disruptions, organizations must have access to relevant and up-to-date knowledge, where the major role plays implementation of knowledge management (KM). Quality management systems – Requirements standard, ISO 9001:2015 [2] also emphasizes the importance of determining knowledge important to organization, acquiring it from external and internal sources, maintaining it and making it available for operation of business processes. To achieve all those requirements, knowledge management is closely connected to information technology, especially to artificial intelligence, with various prospects of its usage.

This paper is structured as follows. In Chapter 2 is given an overview of development of knowledge management and its pillars. Chapter 3 describes well known and used knowledge man-

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agement technologies. Disruption of organization is presented in Chapter 4 and the connection and role of knowledge management in overcoming disruption in Chapter 5. New important knowledge management technologies are described in Chapter 6, whereas Chapter 7 concludes the paper.

2. KNOWLEDGE MANAGEMENT

The term knowledge management is well known and used for several decades. It was researched both in general and for application in specific fields and covers all processes related to manipulation of knowledge and information in organizations: creating, managing, sharing and using [3]. Development of the field has undergone several stages (or phases) that were concentrated on the following [4], [5]:

1992-1995, Information technology. In the first stage, with emergence of personal computers and Internet, the accent was on information technology, because it offered various possibilities to store and manipulate larger quantities of information and specially to share knowledge more effectively and faster.

1995-2002, Human and cultural dimension. The second stage is characterized with recognition that information technology cannot provide solution if people don't use it to create, manage, share and use knowledge, which is why the concept of knowledge management should be incorporated into organizational culture.

2002-2008, Content and reliability. The content of the knowledge management system, the structure of knowledge and its availability to the person that needs it when it needs it is the main consideration of stage three, when important topics became content management and taxonomies.

2008-now, Access to external information. Stage four has no clear delineation and it is characterized with inclusion of knowledge available in the environment of the organization into knowledge management systems that mostly contained internal knowledge.

Each stage just added new emphasis that was not properly taken into account in earlier phases and contributed to maturation of knowledge management.

Information technology was the first important part of knowledge management and still stays one of main elements. It is depicted as one of four pillars that support knowledge management in a well-known representation of knowledge management that can be seen in Figure 1. The four pillars are [6], [7]:

Leadership – includes various elements connected to the management of organization and human resources, such as organizational culture that was emphasized in stage two of knowledge management development;
Organization – tackles business processes and procedures in organization, as well as various metrics that measure performance and quality and the use of knowledge for their improvement;

Technology – lists various information technology and systems that enable and support all processes of knowledge management through knowledge lifecycle in organization;

Learning – gives accent on continuous education and lifelong learning as well as on importance of innovation and collaboration that foster knowledge sharing and exchange throughout the organization.

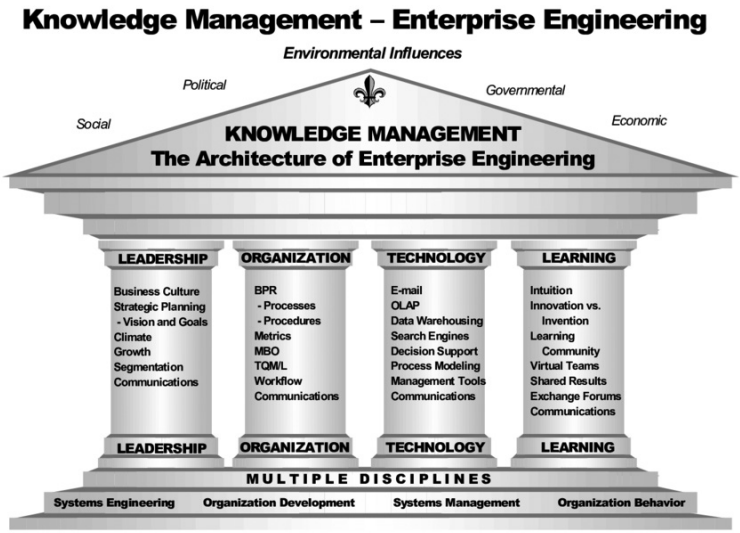

Figure 1: Four pillars of knowledge management [6, p. 6]

As can be seen in Figure 1, communication is listed in all four pillars, which accentuates its importance for knowledge flow at all levels and aspects of organization. Also, on the "roof" are listed environmental influences on knowledge management that can be political, social, governmental and economic. At the bottom are multiple disciplines that include elements from all pillars. Of course, those disciplines are today somewhat different than in 1999, when the representation was made, for example, instead of organizational behavior there is cognitive psychology. Figure 1 clearly shows all intertwined elements that are part of or influence on a knowledge management system.

3. KNOWLEDGE MANAGEMENT TECHNOLOGIES

There are many technologies that are connected with knowledge management and most of them are well known since the first stage of its development. They support one or more processes and mechanisms that organizations use to maximize the utilization of knowledge. Mechanisms are "organizational or structural means used to promote knowledge management" [8]. For example, a meeting is a mechanism and can be supported with some technology (communication tool) if participants are at different parts of the world.

"Standard" knowledge management technologies that are used as part of knowledge management systems are, for example:

- **Databases** – they are used for storage and retrieval of collection of structured data, information and knowledge in a tabular form and today are still mostly relational, although various NoSQL databases are gaining more attention, such as graph databases.
- **Data warehouses** – they differ from databases, because they provide access to data from different sources and multiple databases; they also support data analytics as a part of business intelligence, which enables decision making.

- **Data, text and web mining** – various mining techniques enable discovery of new information and knowledge from large amounts of data, which is today called big data; new knowledge is then visualized and stored.
- **Content management systems (CMS)** – applications that support content creation and management (organizing, editing, publishing) as well as collaboration of multiple users, often for web publishing.
- **Document management systems (DMS)** – they somewhat overlap with CMS, but are used specifically for management of documents and ensure tracking, indexing, storage, retrieval, versioning…
- **Decision support systems (DSS)** – information systems that support decision making processes in organizations and therefore must contain knowledge base, reasoning mechanism and user interface; examples are knowledge-based systems or case-based systems.
- **Lessons learned systems** – systems that capture and store lessons from former business operations important for future activities of organization; lessons must be easily compared with future cases and, if needed, implemented into procedures.
- **Expertise localization systems** – systems that are aimed at easily finding experts for specific tasks within organization, so that their knowledge will be accessed more quickly when needed.
- **Social networks** – online platforms where various social connections can be made and mostly used for marketing and knowledge sharing and exchange among individuals or groups.
- **Blogs** – websites that give information about some topic in the form of diary and may be open for comments, also mostly used for knowledge sharing.
- **Wikis** – websites with multiple collaborators used specifically for providing various and detailed information about some topic.
- **eLearning** – systems aimed for learning with the help of electronic resources using various technologies and multimedia, with an excellent opportunity for sharing knowledge.

4. DISRUPTION OF ORGANIZATION

Word *disruption* is often mentioned today in a connection to business and organizations. Various factors can cause this disruption, such as internal company dynamics (size, management), product lifecycle shift or industry discontinuities that influence competitive advantage (regulations, economy, technology) [9]. Emerging information technologies are disruption that is mentioned very often and they have been researched as such since 1995 [10].

Disruptive innovation is another term that is often mentioned. It is defined as innovation that starts with less-demanding customers or creates new market and become mainstream when quality is considered good enough for demanding customers [10]. According to this theory, Uber, that is often mentioned as disruptive, does not fit the profile, because taxi market existed before and they were not aimed at less-demanding customers. On the other hand, organizations born digital can be considered as disruptors, because their business models were different from the beginning and they opened a new online market. Most prominent example is Netflix. At first, it offered online orders with a several day's delivery via mail, but when it developed a fully online market with streaming, instant delivery, lower price and higher quality, it caused a major disruption to video and CD rentals.

The time that emerging information technologies need to become mainstream is becoming shorter, due to continual and fast innovation processes. To adopt them and stay competitive, organizations must inevitably change their business models. They are mostly aware of disruptive technologies, they know which are most important in their industry, but are not sure whether they are prepared properly, and a research showed that for this preparation organizational (digital) culture and experts are very important [11]. Each organization also has to decide whether it will be bystander or active participant, whether it will cope with digital disruption or maybe cause and lead it.

The commonly suggested answer to successfully overcome disruption, especially disruptive technologies, is *digital transformation.* It represents a transformation of business strategy and organizational activities and processes, with implementation of various information technologies and with the purpose to improve performance and delivery of products or services to customers. Although it is one of main concerns for organizations in 2019, it should not be focused on technology – the main factors of its success and of selection of digital tools are business strategy, employee knowledge and expertise, customer needs and agile decision making [12]. Therefore, before deciding which information technologies to implement and how they will be used, organizations need to consider various factors that indicate the connection to knowledge management.

5. THE ROLE OF KNOWLEDGE MANAGEMENT

There are four pillars of knowledge management that are presented in Chapter 2, and there are also seven pillars of digital transformation. Since digital transformation is considered to be important for organizations to overcome disruptions, especially those connected to technology, as discussed in Chapter 4, here will be explained connection of those two pillars, that actually shows why it is important for organizations to give special attention to knowledge management in disruptive times and when they enter digital transformation.

Seven pillars of digital transformation are [13], [14]:

- Experiences – both experiences of customers (behaviors, expectations, satisfaction) and of employees (organization culture, efficiency, technology support) are important factors when deciding about investments in new technologies and conducting a process of digital transformation;
- People – experts in the field are important, but all employees are valuable and technology should make their work easier and help them to connect, learn and share;
- Change – transformation is continuous change and all employees should know what is expected, accept it and be included in the process;
- Innovation – transformation is triggered by innovation, which can be small, but also large and disruptive;
- Leadership – the success of transformation depends on management, that must incorporate it in business strategy, support it at all levels and effectively communicate it throughout organization;
- Technology – new innovative technology is important part of digital transformation, but it must be implemented in accordance with other pillars to enable a competitive advantage of organization;
- Culture – all above pillars are creating organizational culture that should be open to change and digital transformation, with people at its center.

Those seven pillars can be very easily connected to four pillars of knowledge management, which is depicted in Figure 2.

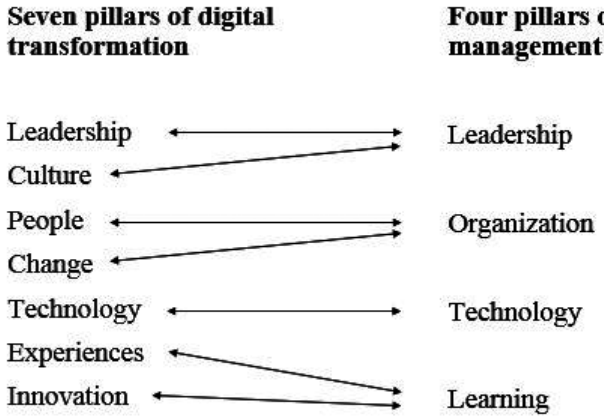

Figure 2: Connection of digital transformation and knowledge management pillars

Leadership is included as a pillar both in digital transformation and knowledge management, and a culture can also be connected with it, because leadership influences how organizational culture will be developed. Organization as a pillar of knowledge management is connected to people and change. People are the most important asset of organization and the change depends on them and includes them. Technology is obviously important part on both sides, and can support new forms of conducting a business, such as digital business or digital workforce. Last knowledge management pillar, learning, can be connected to experiences because they help organization to learn from them, and also to innovation, because learning leads to innovation, but innovation also enables learning. It is obviously that pillars of digital transformation and knowledge management can be viewed as the same or at least very similar and that knowledge management is inseparable part of digital transformation. Of course, the right technology should be implemented to foster all other pillars on both sides.

It is obvious that one of the main issues is that technology should never come first and managers must be aware of this when they start the digital transformation. Also, the most important part and challenge, mentioned several times above, is organizational culture that must be transformed itself to support the changes. The process of digital transformation is continuous and includes all parts of organization and therefore must be supported at all of its levels and within knowledge management system.

6. NEW TRENDS FOR KNOWLEDGE MANAGEMENT

There are many new technologies that can provide improvements in knowledge management, although they are not originally intended for it [15], and help the process of digital transformation of organization. In fact, enlargement of quantity of data that has to be put to use, such as from big data and internet of things, inevitably influence the change in knowledge management systems, since KM has to adopt new technologies in order to continue to manage organizational knowledge effectively [16]. A survey from 2015 showed that in this process communication and promotion of knowledge sharing still stay as top priorities and that organizations expect in next three years that following technologies will impact knowledge management: big data and analytics, semantic technology and natural language processing, and machine learning and cognitive computing [17].

Some of most prominent emerging information technologies that knowledge management should make advantage of are:

- **Big data analytics** – the use of various analysis techniques and methods to find patterns in large volume of data of various types and from various sources so that organizations could make faster and better decisions and develop new products or offer new services; it can also include collection, organization and visualization of data.
- **Machine learning (ML)** – a technology that enables predictions and decisions based on algorithms and statistical models without the need of explicit programming, but on the basis of learning from sample data; can be part of big data analytics.
- **Natural language processing (NLP)** – the field that is investigating human-computer interaction, and develops techniques that enable understanding and manipulation of human language; usually includes text analytics and sentiment analysis.
- **Cognitive computing** – it is comprised of various technologies, including all mentioned above, to mimic the function of a human brain and therefore improve decision making.
- **Augmented reality (AR)** – represents interactive display of environment that is augmented by computer generated information; it can make additions to reality or mask it.
- **Internet of Things (IoT)** – includes everything that is embedded with various electronics that enable connectivity to Internet; the source of large amounts of valuable data that is gathered with, for example, sensors.
- **Smart machines** – machines embedded with various devices that include above mentioned technologies and enable self-learning, for example robots or self-driving cars; they are one of most disruptive technologies.
- **Semantic technology** – a technology that gives meaning and relationships to data using formal semantics and includes various standards and languages to develop ontologies (knowledge bases, knowledge graphs) and reason over them, with the purpose for machines to process and retrieve information based on meaning and logic.

Common to all these technologies is *artificial intelligence (AI)*, the area of computer science that studies intelligent agents and whose goal is to develop intelligent machines that can perform tasks such as reasoning, problem solving, learning and planning. Artificial intelligence is well known and it has been in the focus of research for many years, getting more and more attention. It includes many technologies and has overlapping fields with other areas, and all above mentioned technologies are fully or partially part of it. Also, the basis of both artificial intelligence and knowledge management is knowledge and therefore different AI technologies can foster all KM processes that are dealing with creating, managing, sharing and using organizational knowledge [8]. Implementation of those technologies enables faster discovery of critical knowledge from data, faster data analysis, support directly to decision making process, better knowledge sharing and consequently improvements in products and services. Any of new technologies can be useful in knowledge management. For example, augmented reality can be used in the form of smart glasses for employees that can instantly show information about co-workers and in that way influence socialization and sharing.

Interesting example is the use of conversational artificial intelligence (chatbot) within knowledge management system and benefits of such system are represented in Figure 3.

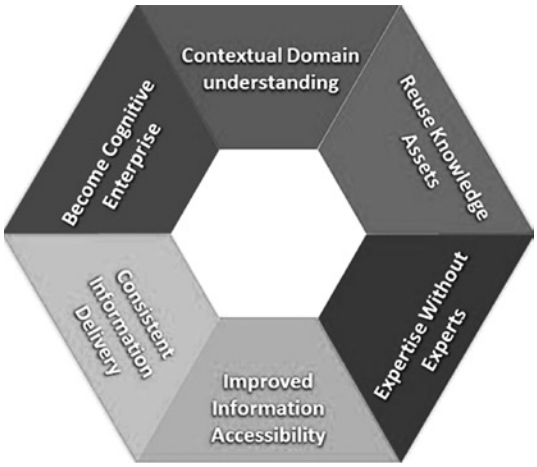

Figure 3: 6 Advantages of Building conversational AI around KM [18]

Chatbot can have contextual domain understanding if it is based on ontology and can reuse knowledge assets as conversational knowledge and make expertise knowledge widely available, where virtual assistant ensures better and consistent access to information thus leading organization to become cognitive enterprise [18].

7. CONCLUSION

Knowledge management is more important than ever in disruptive times for organizations and can be used to successfully conduct digital transformation. On the other hand, as the organization itself is disrupted by various factors, including emerging information technology, this disruption also influences knowledge management. Knowledge management system must support the processes of creating, managing, sharing and using knowledge that is obtained from increasing amounts of data and should be available as soon as possible. This means implementation of new technologies that can ensure that those processes can be carried out effectively. Many of those technologies are part of artificial intelligence and therefore it has large role in future of knowledge management and digital transformation.

However, the pillars of knowledge management and digital transformation, as well as other research, show that the most important factor in successful management of an organization and adaptation to changes are people. No matter which technology we implement, people are still the driving force of an organization and managers must carefully form the organizational culture to ensure support for necessary changes.

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