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A LITERATURE REVIEW FOR KNOWLEDGE MANAGEMENT MATURITY SCALE FOR ARCHITECTURE FIRMS OF TURKEY

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Abstract

Knowledge is one of the most significant resources of our era. Usage and management of it provides formation and development for organizational memory. Knowledge management is now a core practice for gaining an advantage in competitive market conditions used by organizations. That practice can be used for collecting, transferring, safely keeping and managing knowledge. Managing knowledge has importance within the architecture industry where project knowledge needs to be used and delivered effectively. Due to this the architectural design is knowledge-centric planning based on why and how to do a job, how to reach the perfect solution. The implementation of knowledge management has various degrees in every organization. Knowledge management maturity is recognized as determining the level of companies at managing knowledge. This study aims to review literature for works about these terms and to make a stride to propose a scaling system for knowledge management maturity levels for architecture companies of Turkey in the consideration of information received in future studies. Knowledge management maturity models are scaled at 4 to 6 levels in various reviewed works. However, there is no common accepted scale. Although various studies have been made about knowledge management maturity models for enterprises in the world, there is no work to create a maturity model for architecture firms of Turkey.

1. INTRODUCTION

Knowledge is one of the most important conceptions of this era we live in. Lots of researches and surveys are being done either in academic or industrial area about this phenomenon and its management. The emergence of information era as an actor of the globalization in the economy lead to changes in the business world, knowledge management became the most important part of building an organization [1]. Today it is a certain work for organizations to use knowledge management to be innovative and gaining advantages in competitive market conditions [2].

Organizations can provide convenience for themselves in solving issues and problems by managing knowledge. However, in doing so, they shall pay regard to some elements that may procure them optimum use of knowledge management. For this reason, organizations had the best to investigate and evaluate knowledge management practices that will enable them to achieve their management objectives.
Competition projects create a space where architects who are gaining professional experience, and who have been working as architects for some time can achieve professional satisfaction in contrast to methods of existing in the market conditions and exhibit the design standards that they consider right, while also allowing young and talented architects who are considered not to have adequate professional experience to introduce themselves and find a place in the market. Architecture competitions do not only benefit architects, but also property owner, users, city dwellers and the city through the projects that are acquired.

Architecture, engineering and construction (AEC) industry where knowledge becomes more of an issue; it is a highly competitive market with low income limits. This competitive environment making managing knowledge more desirable [3]. Moreover, every organization has its own degree in knowledge management

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in this industry. That degree represents knowledge management maturity of the organization. Yet there is no enough competence to identify KMM of architecture firms, especially in Turkey. The objective of this study is to present the finding of a review of literature on the subject mentioned above in order to point knowledge gap about knowledge management in architecture firms. To do so, it will be beneficial for identifying knowledge management maturity models and propose new scaling systems for architecture firms in future works.

2. Knowledge and Knowledge Management in Organizations

Knowledge

It should be mentioned what knowledge is to the end that comprehends the knowledge management practices in organizations. Nonaka and Takeuchi [4] define knowledge as a justifiedly accurate belief and also vital resource for organizations that gives business advantage. According to Udeaja [5] knowledge is the meaningful and causal form of information. Roberts, on the other hand, describes knowledge as a fact that can be tacit or explicit form in a social and cultural context, which is beneficial and applicable [6]. holds the competition, the members of the jury, properties specified in the specifications, and the

Knowledge has the likelihood of confusion with concepts of information and data. The data has potential implications for the interpreter. Events, measurements, perceptions and statistics can be presented as data. Then, information can be described as an organized, processed and structured form of data. It is essentially the processing of raw data [7]. Knowledge is actionable information with a conceptual framework. Besides, knowledge has the ability to change over time depending on the change in perception of the target environment [8]. The meaning and definition of the basic principles of knowledge models are called wisdom. As can be understood from the definitions, there is a hierarchical order (Figure 1) between the concepts of data, information, knowledge and wisdom:

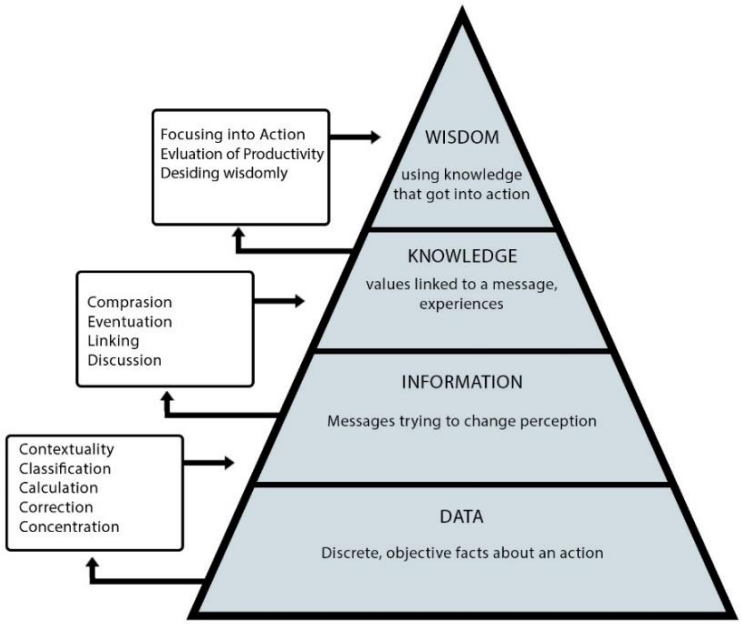

Figure 1. Knowledge Hierarchy [9]

As Information is accepted by an individual as a conception of what is true, it becomes individual knowledge. However, being accepted by a consensus of people makes it organizational knowledge. Common knowledge has no necessity to be shared with all members of an organization for existence. It is enough to be accepted by a group of people considered sufficient condition [10].

Knowledge

Knowledge has a richer and higher infrastructure compared to information and data. Its emergence as a result of human interaction is the most important feature that distinguishes it from others, it does not expect to be found or revealed. It is necessary to understand the interaction between people and the process of knowledge production to understand knowledge [11].
The qualities of knowledge can be listed as subjectivity, process-relationality, aesthetics and the result of practice [11, 12]:

Subjectivity: Different perspectives of people are necessary for the formation of knowledge that emerges through human interactions. Knowledge exists with values and contexts, and what makes it knowledge is value judgments. Each organization has its own perception that is distinct from other ones.

Process-relationality: Humans are not uninterested beings defined by environmental factors, but rather beings that define themselves and shape the environment through interaction between them. Knowledge comes from a combination of different contexts that people form from different perspectives; it is the social action of defining truth. Knowledge in organizations is formed by the interaction of employees, market and competitive environment.

Aesthetics: People gained aesthetic knowledge to make aesthetic judgments using their sensory-perceptual abilities. Aesthetic sense is also used to determine the type of knowledge to be desired.

Organizations can observe new openings, markets, new technology and business opportunities on their aesthetic senses as well as on their own vision and ideals.

Result of practice: Knowledge emerges depending on the application. As mentioned earlier, knowledge can only be created by applications in certain situations between people.

Types of Knowledge

Knowledge can be divided into two main types: tacit knowledge and explicit knowledge. Tacit knowledge is difficult to file and share because it is personal and contextual [4]. Tacit knowledge can be transmitted through face-to-face interviews, collaborations and lectures [13], while explicit knowledge can be easily shared and directly recorded with words and digits [14].

In organizations, the transfer of tacit knowledge and its sharing and transfer in connection with decision-making process, time management, quality and competition is of great importance [15]. The main limitation of sharing tacit knowledge is the connection between conception and expression. Therefore, interviews in person are more suitable for the dispersion process of tacit knowledge. There must be an expression-based action for translation tacit knowledge into explicit knowledge to achieve documentable results [12].

Apart from those mentioned above, knowledge can be examined in another two characteristic types: general knowledge and specific knowledge. General knowledge is the information that is owned by large masses of community and can be easily transmitted from one person to another. Specific knowledge is owned by a more limited section of people and the more difficult to share and there are also two types of it: technical knowledge and contextual knowledge. While technical specific knowledge means in-depth knowledge in a particular field, contextual specific knowledge means the use of knowledge in a given situation, place and time [16].

Knowledge Management

Understanding the significance of knowledge and its transfer, knowledge management and knowledge management systems concepts have emerged. Knowledge management is the technique used in organizations to collect, transfer, secure and manage knowledge systematically [17].
Organizations are generally unable to get enough benefit from the knowledge they possess just as humans are not able to capitalize on the potential of their brains. So they seek to obtain or generate useful knowledge and make it accessible at a convenient time and place so that they can achieve maximum effective use to

positively impact organizational performance. In general, if an organization can increase its effective use of knowledge and its memory based on this knowledge, it thought to be of great benefit [18]. Organizational memory forms through patterns of interactive relation between techniques, people, and technologies. Since these interactions are shaped by the unique culture of organizations they cannot be easily imitated by others [19].

Successful businesses; manage their financial assets such as cash, immovables and infrastructures as well as their talents, experience and methods [20]. Knowledge management enables organizations to strengthen their intellectual assets in order to improve business performance.

The main goal of knowledge management is to facilitate enterprises to make reasonable action plans by grasping their knowledge resources and guaranteeing their success [21]. In order to achieve success in the organizational dimension, knowledge must be transferable between business employees and be able to advance by putting on top of it. Thus, knowledge can provide organizational learning and may be useful in providing solutions for potential future problems and challenges [20].

3. Impacts of Knowledge Management in Organizations

People generally share knowledge through socialization and education [6]. It goes through the processes of formation, storage, transfer and application of knowledge in organizations. It also enters the process of reuse later. The transfer and re-use of knowledge play a significant role in the positive progress of many organizations.

Benefits of Knowledge Management

The perspective which contains knowledge-based intellection features the role and value of employees' implicit knowledge in creating organizational value. The capacity of employees to use their knowledge effectively to achieve organizational goals and objectives depends on the deliberate ongoing investments to benefit from organizational knowledge [22].

Strategic initiatives carried out in this manner have the aim of providing an advantage to the organization in the short and long term. These beneficial impacts are often determined in a business situation and converted into a business plan. The reported benefits of knowledge management are in a wide range and reflect the establishment needs of sectors across sectors. In addition to benefits such as information support, improvements in decision-making context and communication among staff, such strategies provide advanced information about customers and also information for customers. Better job opportunities can be provided with quality, productivity and innovation. Finally, accordingly, a better process and a final product bring about a better financial situation [22].

Knowledge management improves both the knowledge and organizational learning process and then supports organizational learning with a mechanism that identifies the organization's information needs, the status of existing organizational knowledge, and the barriers to knowledge and organizational learning [23].

Issues of Knowledge Management

Knowledge management practices in organizations also have difficulties and problems. Investing in a new technology information management system does not guarantee that the organization will be successful in knowledge management.

The limited state of the information receiver, the distraction, the nature of the knowledge to be transmitted (implicit, confusion, complication, specificity and codability) and the means used between the informant and the receiver of the knowledge; This course covers the concepts that may play a negative role and create difficulties in the success of knowledge management [24].

4. Knowledge Management in Architecture Firms

So far, the effectiveness and efficiency of knowledge management within organizations has been discussed. As this study is specialized research on knowledge management practices in architectural enterprises, it is necessary to make an in-depth examination of the qualifications of architectural enterprises and the previous studies on knowledge management in architectural enterprises.

Architecture Firms

Architecture, engineering and construction industry (AEC); It is a project-based industry where various businesses come together with the interdisciplinary organization to make investments such as buildings, roads and bridges [25].

In this industry, architectural enterprises are obliged to provide a large amount of information. Much of the construction work is based on the knowledge provided at the design stage. Architectural enterprises form the stream of knowledge and link between other individuals and institutions in the construction work [26].

It is important that architecture, which is an information-intensive business, manages architectural knowledge in the whole project process. In the architecture, engineering and construction industry, this feature, which only architecture possesses, makes it necessary for architectural processes to better analyze the knowledge and ongoing operational strategies in the architectural process to exhibit better approaches [26].

Architectural Design Process and Knowledge

The architectural design process focuses on the knowledge of why and how to do a job. Architectural design is information-centered planning for analyzing existing conditions to achieve better possible conditions [27]. According to Zisko-Aksamija, the architectural design is a process depending on tacit knowledge obtained from experience and training, but also using explicit knowledge such as material types, building codes and manufacturer catalog. From this point of view, the link between tacit and explicit knowledge is certain in architectural design [28].

Architectural design is the best analysis for the solution of a specific problem, a subjective action that is specific to the type, area, recipient and designer of the project [26].

The design process is an iterative study in which the results reached may raise new questions until sufficient requirements are met. The Markus-Maver scheme presented by Lawson to express this continuum is shown in Figure 2 [29]:

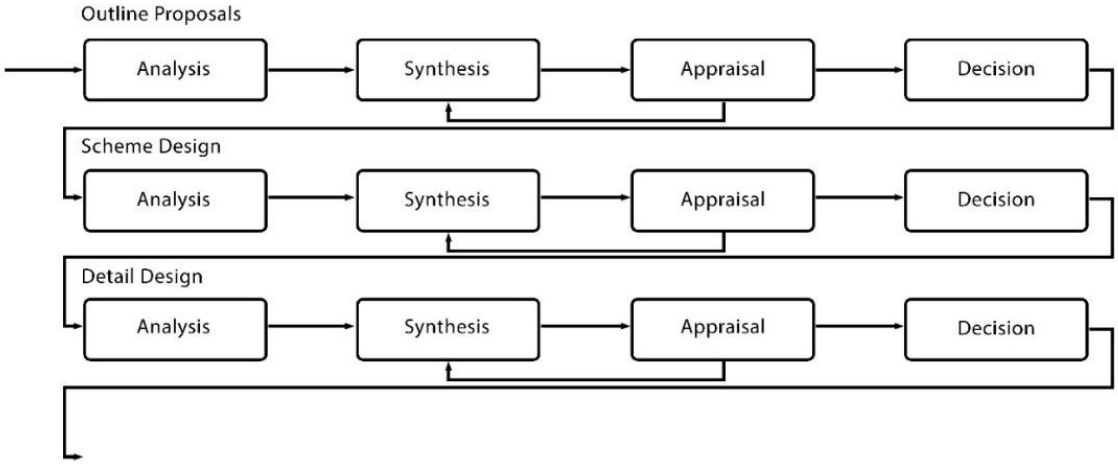

Figure 2. Markus Maver Map of Design Process [29]

In order to reveal the constraints and possible solutions related to the current situation of the project, the architect collecting data and information and determines the way to produce the final product [26].

Knowledge Management in Architecture Firms

The necessity of being innovative in AEC sector, providing high performance and customer satisfaction is the main reason for using knowledge management in the sector. Service buyers are becoming more and more informed and want to obtain more products with lower investments in the sector, which is constantly changing and developing. So desired projects are becoming more complicated [25]. As in the architectural industry, in the design of sophisticated product, the complexity of architectural design increases depending on the complexity of outcome. According to Herbert Simon, who discusses the limited rationality of individuals, this concept is proof that the human mind cannot grow to meet all the needs. Therefore, depending on the level of complexity, the design context may require more knowledge to be managed than a single individual can handle [30, 31]. Knowledge management in architectural firms is the system that enables the process and management of knowledge by stepping in at this point.

In the architectural design process, managing knowledge is vital to reach the required knowledge at the right time and to make the perfect decision. However, the subjectivity of the knowledge required in the project production process and the fact that it is generally in tacit form is the biggest factor that makes it difficult to manage knowledge in the field of architecture.

The work that architecture firms need to do varies by country. Services provided by the architectural office in Turkey are divided into four main sections: the preliminary design, design development, construction documents, detail drawings. Again, in each of these four sections, the work that the architect should do is defined by the chamber of architects. At the preliminary project stage, the architect creates the architectural concept in line with the needs schedule and cost. The architect determines the construction systems and equipment by measuring the building elements according to the preliminary project approved in the design development stage. During the documents phase, technical drawings of architectural elements are made and projects that can be used in offices and construction sites are prepared at every stage of construction. In the detail phase, particular drawings of the required elements and locations are provided at the desired scales. However, this arrangement tells what architectural companies should do, not how they should do it. This situation stems from the subjective structure of architecture. Due to this subjective structure, design and project planning is a flexible process [32].

It is of great importance to manage knowledge, to provide inspection and controls during the project design phase. This issue, which has not been shown necessary care in our country until recent years, has been applied in Europe for 30 years and in America for more than 50 years. Project review and checks in Turkey are carried out based on the principles of architectural drawings organized by the Ministry of Environment and Urbanization and Chamber of Architects. Some private institutions have established project management units within their own body [33].

According to research carried out by The Architects' Council of Europe (ACE), 50.000 architects are registered and there are 10.341 registered architectural offices by the year 2016. While 88 percent of these offices have fewer than 5 employees, 66 percent of registered members are under 40 years of age. Also, Turkey ranks fourth in Europe in terms of the number of active architects [34].

As can be expected, the larger the firm, the more need for systematic knowledge management. The diversity of companies in the architecture sector in terms of size and work requires more specialized knowledge management practices. However, the architectural firm in Turkey needs of guidance in order to find the right system for itself [35].

Knowledge management practices are critical for architecture businesses. But I can say that there are deficiencies in knowledge management in Turkey's architecture industry in the consideration of my professional experiences and studied worked earlier.

Although the awareness level on the importance of knowledge management in architectural enterprises is high in our country, it is seen that expectations for outcomes such as profit increase and innovation are neglected in designs. The lack of standards in the design process, insufficient time and the characteristics of the architectural project make it difficult to manage architectural knowledge. The main shortcoming of the architectural sector in Turkey can be considered as the lack of long-term corporate organization [26].

5. Knowledge Management Maturity in Architecture Firms

Although maturity is the situation of being finished, completed and perfect. In this study, maturity can be considered as being developed as necessary in terms of knowledge and knowledge management. Just as a person's maturity expresses that he has achieved perfection on an individual basis, organizational maturity expresses the perfection of the organization by conceptualizing it in the same way [36].
Maturity in knowledge management is the application of the organization by effectively managing and improving knowledge management processes [37]. The knowledge management maturity model expresses the place of an enterprise in its development from the lowest to the highest level in this field. According to Klimko, maturity models have four characteristics [38]:

1. The maturity level of each enterprise is defined by a limited number of stages
2. Between each stage, there are certain conditions that the company must meet.
3. The levels are ordered from the beginning level to the last level.
4. During the development process, enterprises move from one level to the next. They can't skip over one.

Although various classifications have been established regarding the knowledge management maturity of organizations, it has not become a definite standard. Klimko's knowledge management maturity model has been formed in four stages as 1. initiation, 2. propagation, 3. integration and 4. networking [38]. Paulzen and Kulkarni have presented 5-stage models. Paulzen defined these levels as 1. initial, 2. awareness, 3. formation established, 4. measured and 5. optimizing [39]. Kulkarni listed it as 1. possible, 2. encouraged, 3. practiced, 4. managed and 5. continuously improved [37]. Grundstein builds the knowledge management maturity model on six levels: 0. non-existent, 1. initial, 2. repeatable but intuitive, 3. defined process, 4. managed and measurable, 5. optimized [40]. Kuriakose, on the other hand, revealed a six-stage knowledge management maturity model, which includes 0. default, 1. initial, 2. qualitative development, 3. quantitative development, 4. maturity, 5. extended [41].

Table 1. Knowledge Management Maturity Models in Literature

	Klimko (2001)	Paulzen (2002)	Kulkarni (2003)	Grundstein (2008)	Kuriakose (2011)
Level 0	-	-	-	Non-existent	Default
Level 1	Initiation	Initial	Possible	Initial	Initial
Level 2	Propagation	Awareness	Encouraged	Repeatable but Intuitive	Qualitative Development
Level 3	Integration	Formation Established	Practiced	Defined Process	Quantitative Development
Level 4	Networking	Measured	Managed	Managed and Measurable	Maturity
Level 5	-	Optimizing	Continuously Improved	Optimized	Extended

Although there are several studies carried out about knowledge management maturity in small and medium enterprises like architecture firms in the world, there is no work to create a maturity model in Turkey for architectural design firms.

6. Conclusions

In this study, the definition, scope, scaling and importance and benefits of information management concepts are discussed. In addition, a step has been taken to make the subject of research in Turkish literature. The general understanding of knowledge, its transfer and management is a source of great importance for organizations. Today, understanding, awareness and implementation of knowledge management are vital for companies. With the help of knowledge management practices, the organizational memory of the enterprises is created, protected and developed.

Especially in the architecture, engineering and construction sector, it is emphasized in the literature that project knowledge should be used and transferred effectively. However, various difficulties can be encountered in the execution of knowledge management. One of these challenges -especially in architectural industry- is that information is often implicit. Due to this and other reasons or lack of awareness, organizations' level of knowledge management varies.

In the literature, there are various knowledge management maturity models for small and medium enterprises consisting of 4, 5 or 6 levels to rank these levels. However, there is no generally accepted scale. Yet there is not any work on this issue in Turkey. Due to this knowledge gap, more research on this topic is a strong need in order to provide enlightenment about knowledge management activities and knowledge management maturity so organizations can get the best of its benefits.

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