The Role Of Computer Technologies In Knowledge Acquisition

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ABSTRACT:

The concept of knowledge management is becoming increasingly interested to both academia and practitioners. The aim of the research is to answer a question 'the role of computer technologies in knowledge acquisition?' A comprehensive review of literature covering the topics of knowledge management and the organizational knowledge was conducted to answer this question. This literature review seeks to establish the nexus between computer technologies and knowledge management. To achieve this, thorough reviews of articles are done in a number of areas and a significant body of literature on knowledge management is summarized. Based on the review of the literature it has shown that there is a connection between the computer technologies and their role in knowledge acquisition in an organizational setting.

Keywords: *Knowledge management, Knowledge creation, Knowledge sharing, computer technology*

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1. Introduction

People are living beings, therefore our knowledge is alive. We are constantly creating a reality that makes us feel positive about ourselves. The organizational learning system is an endless cycle that sustains success for business organizations. When an individual produces an innovative work and creates a new idea based on new learning, the successful entrepreneurs acquisition that innovation immediately by cycling it back into market by creating a product or a service using this knowledge.

According to Alavi and Leidner (2001), data is the representation of raw numbers and facts. Once the data is systematically processed, organized, or given structure, it turns into information. When individuals posses such information into their brain and apply it to take actions or make decisions then it will be considered as knowledge. There are abundant studies on the knowledge sharing (KS) and knowledge management (KM) field. However, there are still opportunities for research on what is the role of computer technology (CT) in KM? Even though the CT has established itself as a very important tool for information exchange between people, the knowledge is highly dependent on our experience, beliefs, and values (Van Der Velden, 2002). Can CT enable the knowledge creation and sharing the same way it does with information sharing? This researcher will provide findings from literature review and impressions of the emerging debate around KM and the role of CT.

The structure of this paper will consist of several sections. The first, second and third sections will introduce the knowledge and knowledge management. The fourth section

will focus on major approaches to KM. The fifth, sixth and seventh sections will concentrate on defining knowledge creation, knowledge acquisition, and the knowledge sharing components of KM respectively. The eighth and ninth sections will compare and contrast the knowledge acquisition with knowledge creation and knowledge sharing. The tenth section will describe the organizational knowledge and how they are connected with the knowledge acquisition. The eleventh section of this paper will examine the role that computer technology plays in acquiring organizational knowledge. The last section of this paper provides the conclusion.

2. What is Knowledge?

Knowledge management has received widespread attention in recent years. Companies and academics have highlighted the importance of knowledge as the basis for competitive advantage (Teece, 1998), hence it is very important to define the 'knowledge' first. Knowledge is defined as the ability to remember previously learned material or information which range from interpreting specific facts to analyzing complete theories. When an organization is able to maximize and leverage their technical and business development resources, it will enhance the company's competitive advantage.

Nonaka (1994) suggested, based on Polanyi's (1966) conceptualization, that knowledge can be classified as explicit and tacit knowledge. Tacit knowledge deals with an individual's experiences and know-how. This type of knowledge is increasingly considered as an important type of information. This intangible resource is difficult to acquire and imitate. Therefore, it is regarded as the most important source which could be within an individual or group, or an organization. In contrast, the explicit knowledge comes in the form of books, documents, white papers, databases, standards and policy manuals (Nonaka, 1994). Explicit knowledge also called leaky knowledge (Alavi & Leidner, 2001) because this explicit knowledge can leave an individual or an organization very easily.

3. What is Knowledge Management?

Knowledge management in general tries to organize and make available important know-how's. The data represents a basic raw form of observations or a fact from a context; therefore, it will not provide a direct meaning. Where as information in the other hand, will provide results if data is placed within some meaningful context. This is often achieved after analysis or synthesis of the data; hence one has to understand the difference between data, information, and knowledge.

Rastogi (2000) defined the knowledge management as a systematic and integrative process of coordinating organization wide activities of acquiring, creating, storing, sharing, developing, and deploying knowledge by individuals and groups in pursuit of organizational goals. Von Krogh (2000) suggested that knowledge management in an organization must be considered from three different perspectives and they are: a business perspective, a management perspective, and a hands-on operational perspective. These three practically cover all the facts of the organizational knowledge needs.

A more general approach to the analysis of knowledge management strategies is the one introduced by Hansen, Nohria, and Tierney (1999), who distinguished between a codification strategy and a personalization strategy. Procedures to elicit knowledge from employees, converting it into a systematized form, and storing it in a company wide repository are core activities in this codification strategy. However, knowledge is often very implicit and tacit; it is built upon personal experiences and reflected in skills. In contrast, the personalization strategy focuses on the exchange of tacit knowledge and mostly emphasizes on people meetings, which is interpersonal knowledge sharing. This strategy enforces a philosophy in the knowledge sharer as it enhances ones status and position when others consult for his/her expertise.

4. Major Approaches to Knowledge Management

4.1. Overview

Wang (2005) has identified two major approaches to knowledge management and they are the codification strategy and the personalization's strategy. The codification strategy focuses on the codification, storing and subsequent re-use of knowledge, and relies heavily on information technology. The personalization strategy, however, encourages a more creative approach to the application of knowledge and thus allow for deeper understanding (Wang, 2005). This distinction is helpful, as implications can be drawn, in particular where these strategies are related to the individual working in organizations in the aspects of knowledge management.

Manuel (2008) suggested three main approaches for knowledge management and they are: 1) Mechanistic Approach, focusing on use of Information Technology (IT) in the management of knowledge resources, 2) Cultural / Behavioral Approach, focusing on work culture and organizational behavior to encourage people to share, transfer and preserve those resources and 3) Systematic Approach, focusing on ongoing processes of refining and updating knowledge resources and rational analysis of knowledge related problems and resolving techniques.

Knowledge management programs rely to a large extent on the ability and willingness of employees to share knowledge appropriately and freely in an organization. The staff will have to let go of the long-established philosophy that "knowledge is power," (Hargadon, 1998, p. 211) and embrace in its place the view that "knowledge sharing is power." In order to achieve this, trust is required between the staff. Without trust, knowledge management initiatives will fail, regardless of how thoroughly they are supported by the management or technology.

Two fundamental approaches to knowledge management defined by Hansen et al. (1999) are the process approach and the practice approach. The process approach predominantly focuses on how to codify organizational knowledge. This can be done by applying computer technologies such as data warehousing, decision support tools, intranets, knowledge repositories, and groupware. This will not only enhance the speed and quality of creation of knowledge, but also the distribution of this knowledge within the organization. More over it forces individuals to think in a fixed pattern (Brown &

Duguid, 2000; Hargadon, 1998; Von Krogh, 2000). The main weakness of this process approach is that it fails to acquisition much of the tacit knowledge embedded in firms.

In contrast, the practice approach to knowledge management assumes that more of the organizational knowledge is tacit. This suggests that the formal processes, controls, and computer technologies are may not be suitable for this type of knowledge transfer. Instead, the practice approach focuses on how to build social environments to collaborate the tacit knowledge sharing (Brown & Duguid, 2000; Gupta & Govindarajan, 2000; Hansen et al., 1999). These communities could be informal social networks or groups they meet regularly to share insights, ideas, and best practices, hence successful KM initiatives ideally will include both process and practice approaches as these two complement each other. The common theme from the above literature review is pointing to three core fundamental approach components and they are knowledge creation, knowledge acquisition, and knowledge sharing in the knowledge management space.

4.2.1. Knowledge Creation

Scholars, managers, and strategic policy makers have recognized the importance of knowledge and its creation with greater frequency over the past decade. However, the specific factors associated with the process of knowledge creation in research and development (R&D) are yet to be fully elucidated and examined (Johnson, 2002). This paper stems from research that utilized Nonaka and Takeuchi's (1995) theory of organizational knowledge creation as the reference framework.

Organizations acquire knowledge from both external and internal sources. The ways to acquire information from external sources are: 1) best practices and benchmarking information from other organizations, 2) attending conferences, 3) hiring consultants, 4) monitoring economic, social and technological trends, 5) collecting data from customers, competitors and resources, 6) hiring new staff, 7) collaborating with other organizations, 8) building alliances, 9) forming joint ventures, and 10) establishing knowledge links with business partners. At the same time, organizations acquire knowledge internally by tapping into the knowledge of its staff, learning from experiences and implementing continuous process improvements.

Nonaka and Takeuchi (1995) introduced four patterns of knowledge creation in organization which are: 1) Socialization, tacit knowledge created from tacit knowledge (from tacit to tacit), 2) Externalization, explicit knowledge created from tacit knowledge (from tacit to explicit), 3) Combination, explicit knowledge created from explicit knowledge (from tacit to explicit), and 4) Internalization, tacit knowledge created from explicit knowledge (from explicit to tacit).

There are also two more different paradigms in the knowledge creation. The first one is a scientific view of knowledge. In this paradigm, the knowledge is considered as a canonical body of facts and rational laws. The second is referred to as a social paradigm of knowledge construction (Burgoyne & Reynolds, 1997). In this paradigm, the knowledge can be socially constructed through employee interchange. This process

will be feeding to the next two processes and they are knowledge acquisition and knowledge sharing. The next big question is how to acquisition this knowledge.

4.2.2. Knowledge Acquisition

One of the biggest problems in KM is to effectively acquisition or to collect the vital information. There are many cases in which knowledge is simply not recorded. Feliciano (2007) describes knowledge acquisition as the process of extracting knowledge from experts and structuring this knowledge into a readable form. He goes on to say that the techniques utilized in doing this are interviewing, observations, protocol analysis and brainstorming (Feliciano, 2007).

The inductive theory of Nonaka and Takeuchi (1995) describes the processes of interplay between explicit and tacit knowledge structures that lead to the creation of new organizational knowledge. Nonaka and Takeuchi (1995) argue that intention is necessary for successful knowledge creation in a single organization situation. As discussed earlier, the knowledge may be tacit or explicit, requiring different means to acquisition it. Knowledge acquisition is ideally driven by strategy: an organization determines what knowledge is needed, what it has, and then fills in the gap by developing new knowledge or acquiring it.

Organizations need an inexpensive and quick means to find and correctly use internal or external knowledge. Knowledge acquisition has several roles: to codify explicit knowledge, to convert tacit knowledge to an explicit form and codify, and to acquisition tacit knowledge as explicit meta-knowledge (knowledge about knowledge). This is generally a directory of "who knows what" and how to contact them. The purpose of the codification is to make it easy to organize, locate, share, store, and use the knowledge (Davenport & Prusak, 1998). Common materials containing codified knowledge are manuals, spreadsheets, decision support systems and procedures (Zollo & Winter, 2002). However, the codification process is generally expensive and it is difficult to code for universal understanding too. All these codified materials exist within the organizations memory only. So, in order to overcome this deficiency, the organizations need to use the information technologies to acquisition and share the knowledge.

4.2.3. Knowledge Sharing

Sharing knowledge among members of an organization is a pivotal component of effective management of organizational knowledge. Individuals in any organization do not share their knowledge freely under all circumstances. These individuals need to be somehow motivated to create, share, and use knowledge (Davenport & Prusak, 1998). This is the key factor for a successful knowledge sharing as the knowledge itself does not flow or grow on its own.

Alavi and Leidner (2001) consider this knowledge sharing as one of the key processes in the overall knowledge management framework. Also from the literary review, this researcher identified that there are several organizational factors that will contribute or affect knowledge sharing in an organization such as organizational culture,

organizational structure, leadership, and information systems. Knowledge sharing is similar to organizational citizenship behaviors that occur in organizations mainly because it is voluntary. Even the informal knowledge sharing in organizations can be very effective (Davenport & Prusak, 1998). That is why Knowledge sharing is essential for organizations and should be encouraged and rewarded.

Knowledge sharing is part of the KM system of an organization and the operational objective of KM as to ensure that the right knowledge is available to the right processors at the right time for performing their knowledge activities (Manuel, 2008). That is why one must understand that knowledge sharing and KM are not equivalent. Additionally, knowledge sharing can save time and improve quality by providing appropriate solutions to organizations.

5. Discussion

5.1. Comparing Knowledge Creation, Knowledge Acquisition & Knowledge Sharing

Organizational IT project success and failure can often depend on knowing which of them you need, which you have, and what you can and can't do. Understanding what the organizational IT project success needs and the basic knowledge ingredients, such as data, information, and knowledge are essential to perform the knowledge work successfully. There are several commonalities between the knowledge approach components such as knowledge creation, knowledge acquisition, and knowledge sharing. The first and fundamental common aspect is, all these three will assist in IT project success in an organization.

As discussed earlier, there are two major approaches to knowledge management and they are 1) the process approach and 2) the practice approach. The process approach adopts the codifying organizational knowledge approach using formalized processes, controls, and computer technologies (Hansen et al, 1999). In contrast, the process approach adopts explicit policies such as, how explicit knowledge is acquisitioned, stored, and shared across the organization. The process approach adopts a heavy IT for connecting people with reusable and codified knowledge. On the contrary, the practice approach uses moderate IT infrastructure. Having discussed these foundations, now let us discuss the infrastructure and management tasks.

Many managerial tasks cannot be learned from a book; they take years of trial and error experience to learn. Valuable sharing of knowledge occurs in managerial staff meetings where younger managers reap the benefits of watching and learning from other, more experienced managers. This is also true for knowledge workers since much of the sharing of knowledge occurs by watching others execute their tasks. Knowledge sharing works more efficiently when the receiver and giver of knowledge are actively involved in the task of knowledge sharing. This requires a willingness of both parties to be both students and teachers of knowledge, regardless of employee age, to benefit from everyone's knowledge.

One needs to identify the kinds of knowledge that will create the most value for an organization and create ways for increasing that knowledge using the computer technology. Once that knowledge is identified then one can come up with ways to acquire or generate knowledge (Cummings & Worley, 2005). One can acquire the knowledge by using strategic alliances, joint ventures, and social relationships by using the people, process, and technology.

Normative motivation is seen to be essential in knowledge sharing and creative activities. This has been examined at an organizational level and these levels could be are different motivators at different levels. The researchers are challenged with a common question. What motivates an employee to share the knowledge? This question brings us to the realm of motivation theories and their implications for the area of knowledge sharing. Perhaps the best-known motivation theory is Maslow's needs hierarchy (Maslow, 1954). Maslow's theory indicates the motivation for knowledge work comes from his three highest hierarchical levels. Their implication is that knowledge workers, for instance, do not share knowledge because of money or to improve their relations with their co-workers. Their motivation rather comes from their desire for self-actualization. This motivation theory to share the knowledge is also applicable to the other two components, the knowledge creation, and acquiring.

The knowledge acquisition does not, however, manage tacit knowledge because tacit dimensions of knowledge are revealed only in social interactions. The aspect of social interactions and tacit knowledge sharing are reflected in the overall knowledge management. The previous knowledge management activities are also affected by organizational learning processes, which can be influenced by organizational characteristics such as cultural and leadership drivers (Cummings & Worley, 2005). These characteristics remain important in all the three components such as knowledge acquisition, knowledge creation and knowledge sharing.

5.2. Contrasting Knowledge Creation, Knowledge Acquisition And Knowledge Sharing

Nonaka (1994) suggested that the creating a new knowledge requires the participation of front line employees, middle managers, and executive leadership. They continued arguing that, everyone in a knowledge creating company is a knowledge worker. But why should an employee share his / her knowledge? What are the motivational factors we need to see is a big question in this approach. At the same time, the managers are challenged with a question: how do we make this newly acquired knowledge in an organization sharable with other members of the organization?

As discussed earlier the four patterns of knowledge creation by Nonaka (1994), are the first patterns of knowledge creation is socialization. In this pattern the tacit knowledge is directly shared from an expert to another person who learns it through observations, imitation, and practice. Since this type of knowledge can not be made explicit, it may be time consuming, costly, and uncertain to share the knowledge from one person to a larger group of people. Thus, the knowledge is not easily shared by the whole organization and can prove to be a more challenging task then knowledge acquisition or knowledge creation.

Knowledge sharing takes place when knowledge is documented and stored for reuse at a later point in time. Recently, Carlesen and Gottschalk (2009) discovered in their empirical research, that there is a significant correlation between the extent of knowledge sharing and the IT projects success rate. Additionally, Sai Ho and Sheng (2005) have investigated an individual's behavior of knowledge sharing with respect to information systems/information technology (IS/IT). The authors found that the extrinsic motivation imposed no impact on an individual's attitude towards knowledge sharing. Leibowitz (2002) had identified in his study the combined use of virtual communities or practice and face-to-face meetings was recommended for better knowledge sharing. Zairi and Al-Mashari (2005) recommended an effective benchmarking and implementation will provide for a better knowledge transfer practices in an organization. McNeish and Mann (2010) reviewed the trust in terms of interpersonal and inter-group relations in knowledge sharing situations within organizations. They have concluded that the knowledge sharing has a path through knowledge transfer to consequences including improved group performance, business decisions, competitive advantage and financial success. Adekunle and Helena (2002) identified variations in factors such as the local cultures and beliefs, the persistent underfunding, and the operating environment influences the knowledge sharing.

Lorenz (2008) referred to knowledge sharing as that related to the creation, transfer, and integration of knowledge. The implication drawn from this statement is that the process of knowledge sharing involves both the creation and transfer of knowledge though different artifacts, such as documentation or communication, among entities. This may prevent knowledge to be shared effectively. In addition to acquiring, creating, and sharing the organizational knowledge, an organization must take steps to ensure that its knowledge is not stolen or used inappropriately (Gold, Malhorta & Segars, 2001). Otherwise the organization will loose their competitive advantage which was envisaged by implementing knowledge management initiatives.

As per Nonaka (1994), the organizational knowledge is created through four modes where interaction and conversion between tacit and explicit knowledge takes place and they are socialization, externalization, combination, and internalization (SECI). Again these four modes fall into the three major categories of knowledge acquisition, create, and share. All these three have a common organizational objective, which is competitive advantage of using the KM. But one of the main differences is the process of developing a new content and replacing existing content within the organization's tacit and explicit knowledge base (Pentland, 1995). Nonaka (1994) suggested that the essential question for knowledge acquisition is establishing an organization's "ba" (defined as a space for creating knowledge). According to Watson and Hewett (2006) "knowledge intensive industries" (p. 141) rely heavily on their capacities to produce and share knowledge, to perform well, and to remain competitive. So this is another common objective of the approaches to the knowledge management.

According to Lorenz (2008), informal learning is necessary to deal with the constant changes that organizations must endure. Extinct are the days where employees learned a singular, focused specialty that carried them through to retirement Lorenz (2008). This essentially means that knowledge creation, knowledge acquisition and knowledge sharing are complimenting each other in an integrated way to achieve the

organizational knowledge goals. Consequently, a deeper understanding about the organizational knowledge must be achieved.

5.3. Organizational Knowledge

Organizational knowledge has knowledge as its key asset and its competitive advantage comes from having and effectively using that knowledge. Popper (1963) stated there is always an increasing need for knowledge to grow and progress continually, whether tacit or explicit. Knowledge grows like any other organism, with data service as food to be assimilated rather than merely stored. Penrose (1959) identified knowledge as part of human resources of an organization. As an organizational resource, individually held knowledge, which is the combined knowledge of all of the organizations employees, become organizational knowledge for sure.

Organizations wishing to manage their knowledge so that it will be accessible in the future must master at least two basic processes in knowledge management space (Probst, Raub & Romhardt, 2000). First, they must filter from the many events, persons, and processes and decide the ones that are worth retaining. Second, they must be able to store their experience in a suitable form. From a practical point of view much of what is considered organizational knowledge is only on loan to the organization as long as that individual that holds it remains as an employee and so long as it has not been acquisitioned and codified. In other words, this migratory knowledge only truly becomes organizational knowledge (Badaracco, 1991) when it is acquisitioned, codified, and made available for dissemination by the organization itself.

5.4. Examining The Role That Computer Technology Plays In Acquiring Organizational Knowledge

The computer technology has been recognized as an enabling tool in facilitating knowledge acquisition in knowledge management. The computer technologies are capable of assisting knowledge seekers and experts engaged in different types of knowledge acquisition process such as socialization, combination, externalization, and internalization (Apostolou, Mentzas & Sakkas, 1999). For the socialization process (where tacit knowledge is transformed to tacit knowledge) the computer technology used as e-mails, discussion lists, bulletin boards, collaborative hypermedia, multimedia conferences, and brainstorming applications. These computer technologies enable user interactions by assisting them to communicate with one another by making the organizational knowledge to be spread across the entire organization.

For the combination process (explicit knowledge is transformed to tacit knowledge), decision support systems and workflow applications are typical supporting tools in this category. For an externalization process (tacit knowledge is transformed to explicit knowledge), organizational memory or repository has a significant role in organizing and structuring knowledge to make it available to other individuals in the organization (Apostolou, Mentzas & Sakkas, 1999). For the internalization process (where explicit knowledge is transformed to tacit knowledge) involves computer technologies such as

data warehousing, data mining, and computer based training to assist novices to re-experience what the experts have done in similar situations.

Hargadon (1998) referred to technology as the presence of computer technology support within an organization. The computer technology plays a crucial role in eliminating boundaries to communication that often inhibit the interaction between the different parts of the organization. The important role of computer technology is its ability to support communication, search for knowledge, and will enable collaborative learning. The following are the computer technologies that have and are being used for acquiring organizational knowledge.

> *Intelligent agents* are software programs or code that accepts input in the form of a user profile indicating the information that is deemed significant in a particular job or in a specific working environment and produces the information in an easy-to-understand manner. Agents are rarely stand-alone programs; rather, they are embedded in other applications programs such as e-mails, word processors, or scheduling programs (Petter, 2000). A simple example of an agent is software that allows users to develop rules for automatically handling e-mail messages, based on subject matter, source, or other characteristics.
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> *Groupware* is software that supports collaborative work and sharing of information in the pursuit of company goals and objectives. Groupware such as the popular Lotus Notes, provide tools to enhance the communication between work groups and keeps everyone up to date on what has transpired (Vail Iii, 1999). Groupware can provide an effective means to put the action into the definition of knowledge, which is, turning information into actionable knowledge.
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> *Electronic networking*, in this context, the KM needs to produce information, acquisition data at the source, transmit it to the data warehouse, analyze it with data mining, and finally transmit the information to the needed entities (Vail Iii, 1999). These knowledge management processes and activities are based on electronic networking architecture, including the Internet, intranet, and extranet, etc.
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> *Knowledge mapping*, Vail Iii (1999) defined a knowledge map as the visual display of relationships of acquisitioned information which will provide a vehicle for the communication of knowledge in an organization. This is a collection of relevant knowledge that is continuously evolving in all its forms (text, pictures, stories, data, and models) in an organization. There are two basic types of knowledge maps, static, and dynamic (Vail Iii, 1999) that can be used to acquisition the organizational knowledge.

6. Limitations And Directions For The Future Study

There are two limitations that need to be acknowledged and addressed regarding this conceptual paper. The first limitation is it has only considered few roles of computer

technologies in knowledge acquisition. The second limitation has to do with the extent to which this is a literature review and a conceptual approach and no study was conducted to evaluate its effectiveness yet. Therefore, a suggested future study would be to apply this conceptual theory and conduct a research and evaluate its effectiveness and application.

7. Conclusions

The implementation of knowledge management approaches and strategies discussed in this paper can comprise all person-oriented, organizational, and technological instruments suitable to dynamically optimize the organization wise level of competencies. This researcher would like to take one practical example to conclude this paper. The financial markets provide a good example of the differences between data, information, and knowledge. Due to the availability of financial data such as real-time stock prices of companies the financial managers have computer technologies to turn this data into information, such as whether a particular stock price is on an uptrend or downtrend. Because every manager is acting on the same information, we would expect every one of them to have a similar level of performance. However, in the real world, we find a few financial managers outperforming the industry average for long time periods of time. This superior performance can only be ascribed to the financial manger's knowledge, their unique experience, values, and insight which were brought to bear in interpreting the same information available to all of their competitors. What happens when this outperforming financial manager leaves one organization and joins another?

As discussed earlier, the computer technologies have acted as a catalyst for KM, but that alone can not deliver the KM (McDermott, 1999). At the same time, one has to recognize that computer technology is a facilitator of KM, or a tool to assist individuals and groups in acquiring organizational knowledge. Ultimately, managing knowledge has become a prominent concern in many organizations as more and more employees leave organizations either because of retirement or for new opportunities. To help ensure a successful knowledge management initiative, the organizations should ensure that they have a supportive learning culture, coupled with processes of acquiring knowledge, knowledge acquisition, and knowledge sharing. Organizations should take knowledge management seriously and begin managing their organizational knowledge as a strategic capability to get a competitive advantage.

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