Review Article

Role of contemporary technologies in health care knowledge management: a review

Getachew W. Tessema[1]*, Muluneh E. Gizaw[2]

[1]Department of Information Systems, [2]Department of Information Technology, College of Informatics, Kombolcha Institute of Technology (KIOT), Wollo University, Kombolcha, Ethiopia

*Correspondence:
Muluneh E. Gizaw,
E-mail: mulexeee@gmail.com

ABSTRACT

The emergence of knowledge management (KM) technologies has been enabling health care sectors to promote effective management of knowledge and provide evidence-based medicine for improving service deliveries. As a result, the health care industry is increasingly becoming a knowledge-based community that depends critically on using technologies to KM activities. This paper attempts to review various literatures and gives an intellectual background to the study from various studies conducted by different researchers on the thoughts of various KM technologies in health systems. According to the study, technologies play a prominent role in health care sectors in utilizing their organizational and personal knowledge effectively which in turn enhances the quality of health care services. The usage and practice of KM in the health sector is increasingly promoted due to the emergence of health information technology. There are number of information technology solutions that assist healthcare sectors in knowledge management. Health care portals, search engines, retrieval and classification tools, e-collaboration tools, content management systems and other technologies are widely employed to manage the massive and ongoing health information and share it with their users. Therefore, it is indispensable to pay special attention in using these technologies to manage organizational and individual knowledge available within and outside healthcare organization. Overall, this study has proved that information and communication technology are valuable to support and scale up knowledge management processes for the effectiveness and quality of health care services.

Keywords: Knowledge, Knowledge management, Technology, Health care

INTRODUCTION

In today's increasingly digital and networked society, the importance and worth of tracing and sharing the dispersed knowledge resources of organizations have received universal recognition. The volume of individual and organizational knowledge captured from electronic databases is also continuing to grow at exponential rates. It is certain that with the shift from the industrial to information-age, organizational knowledge has appeared to be the vital resource.[1] Knowledge is the facts, feelings or experiences known by a person or group of people and to use of this vital resource efficiently and effectively,

organizations need to understand the concept of knowledge management (KM).[2] KM is the process which involves the creation, collection, organization, refinement, dissemination and utilizing of knowledge.

KM has been recognized as a source for improving organization's capabilities resulting in success of the organization.[3] It is also perceived as the management of organizational memory, supported by an organizational memory information system (OMIS) that ropes the essential activities leading to organizational success. It focuses on "doing the right thing" rather than "doing things right" So that fundamental competencies do not become

core inflexibilities in future.[4] Management practitioners and theorists have agreed that any process of management of knowledge would involve the ability to identify and capture existing knowledge, create new knowledge and transfer existing knowledge throughout the organization. Organizations should try to use KM to manage the flow of information and knowledge as KM is considered to have utility in the above context as it deals intrinsically with the learning capacity of human resources of a company.[5]

KM involves people, process and technology as overlying components. These KM components are not focused alone; all are recognized in bike for decision making process. KM provides all-out welfares only when all the insinuations of decision-making process are addressed.[4]

KM is very important for decision makers across all sectors including healthcare, as they must deal with large amounts of data. Managing knowledge in healthcare facilities necessitates evident paybacks at the levels of security and efficacy that make better not only the quality of life of the patients, but also the qualities of the entire work of the health care professionals and costs of the entire health care systems.[3] It is obvious that the nature of healthcare has been unalterably changed within the last fifty years.

The cause of this massive revolution in the nature of healthcare can be traced to the emerging of the twin revolutions of Information Technology and Telecommunications (ITT). These revolutions together have synergistically opened new vistas for healthcare.[5] Much of this progress has been either stimulated by or enabled by advances in computing technology. Information technology can accomplish a lot more than mere storing and retrieving data.[6] It is now possible to allow every computer access to the entire organizational knowledgebase. Healthcare institutions that integrate KM and information and communication technology (ICT) into their main organizational processes are more likely to survive and prosper. These organizations would have a profound understanding of how to use clinical information for creating value in tangible and intangible terms.[5]

ICT allows healthcare organization to use global methodologies that include intellectual capital and various soft wares to meet medical needs. To accelerate these KM processes, computer-based technologies have emerged as a key tool to drive efficacy and usefulness of the health care systems The tools include search engines, retrieval and classification tools, e-collaboration tools, portals and content management systems.[7] Therefore, this study is intended to provide insights about the role of computer based technologies for the effectiveness of KM practices in the health care sectors.

KNOWLEDGE AND KM: CONCEPTUAL PERS-PECTIVE

Knowledge is a consciousness or sympathetic of someone or something, such as facts, information, or descriptions of

skills.[8] It is attained through experience or education that provides an environment and framework for evaluating and incorporating new experiences and knowledge for making decisive decisions. Knowledge is a fluid fusion of framed experience, values, contextual information, expert insight, and grounded intuition. It instigates and is applied in the mind of the knowers. In Institutions, it often becomes embedded not only in documents or repositories, but also in organizational routines, practices and norms. Knowledge enables to create information from data or more valuable information from less valuable information. When someone finds out the nature of knowledge, it is located at the highest level in a hierarchy with information at the middle level and data at the lowest level. It is the deepest, plushest and most valuable of the three. Knowledge resides in people (individuals and groups), artifacts (practices, technologies and repositories) and organizational entities (organizational units, organizations and inter-organizational networks).[9] Figure 1 and 2 indicated below shows the knowledge pyramid and the locations of knowledge respectively.
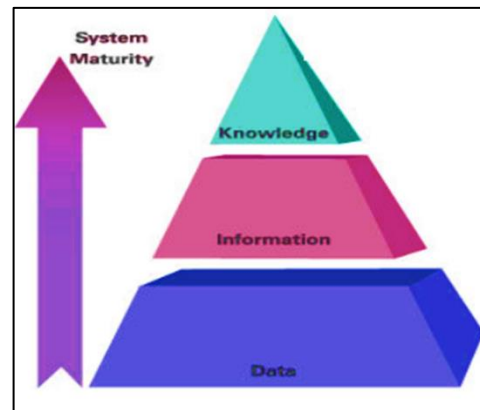
Figure 1: The knowledge pyramid (Ricardo G. M., 2011).
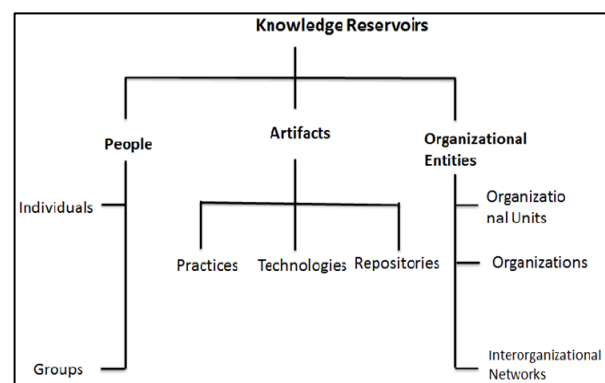
Figure 2: The locations of knowledge.

KM as a discipline is established since 1995. It is intended for addressing the information burden that has evolved over the last few years.[10] KM refers about "managing the corporation's knowledge through a systematically and organizationally specified process for capturing, organizing, developing, sustaining, applying, sharing and

renewing both the tacit and explicit knowledge of employees to enhance organizational performance and create value".[11] World Health Organization (WHO) also defines it as "a set of principles, tools and practices that enable people to create knowledge, and to share, translate and apply what they know to create value and improve effectiveness".[12] It is comprised of a range of practices used by organizations to identify, create, represent, and distribute knowledge management typically focus on strategic objectives such as improved performance, competitive advantage, innovation, the sharing of lessons learned, integration, and continuous enhancement.[13] Modern computer-based technologies, such as ICT are also being seen as the enabling building blocks of KM. It has been acknowledged that it is important to match the ICT application with the type of knowledge transfer being desired. Figure 3 below indicates KM Process and Enabling Technologies. The figure clears that ICT is a crucial substrate of any KM solution.

KM CYCLES

KM cycle is a knowledge spiral that is influenced by the interaction of tacit knowledge and explicit knowledge, leading to four modes of knowledge conversion, such as Socialization, Externalization, Combination, and Internalization, referred to as the SECI model. Socialization involves the sharing of tacit knowledge between individuals, emphasizing seizing knowledge through close physical closeness. Externalization is about the conversion of tacit knowledge to explicit knowledge into understandable form by others. This mode is originated in the semantics and semiotics of communication. Combination comprises building explicit knowledge into a more complex set of explicit knowledge. Internalization is the conversion of explicit knowledge into tacit knowledge which is actionable. These modes sight knowledge as context-specific and depend on a time, space and relationship with others. This context is referred to by the Japanese term 'ba', originally proposed by Japanese philosopher Kitaro Nishida. The SECI model provides four modes of ba. Originating ba is supported through direct interaction and shared experience. Interacting ba assists endorse reflection and interaction between individuals. Cyber ba, involves externalization transcends the group to be combined. Exercising ba is when individuals identify relevant knowledge within organizational knowledge and put this newly attained knowledge into deed.[14] Figure 4 depicts the four characteristics of 'ba' in the KM spiral evolution.
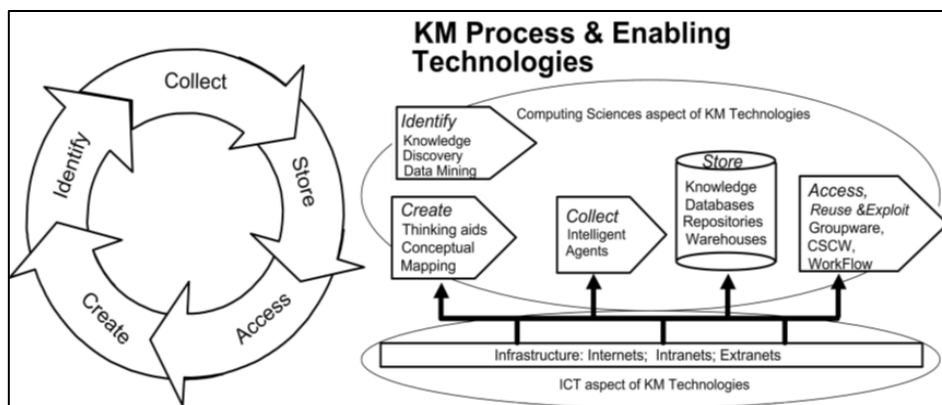

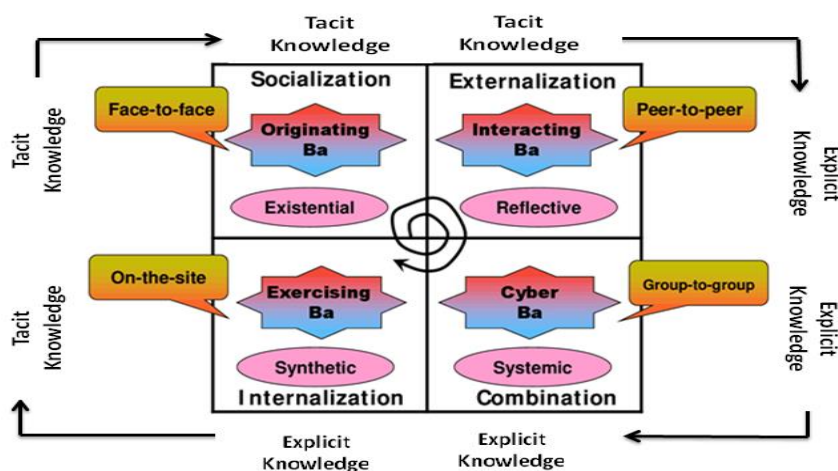**Figure 3: KM process and enabling technologies (Raouf N., 2006).**

Figure 4: The four characteristics of 'ba' in the KM spiral evolution (adopted from Dinarr, 2012).

KM SYSTEMS

KM systems (KMS) is a kind of Information Technology (IT) systems that creates, captures, stores, retrieves, shares, locates, mines and shares knowledge to produce value. KMS records the knowledge as history of past experience and knowledge that arises in the exchange of knowledge between knowledge workers interested in learning.[15] It plays a significant role in improving management performance.[8] KMSs apply mechanisms and technologies to support the KM processes. KM mechanisms are organizational means which enable KMSs and used to promote KM process.[16] Knowledge management technologies are information technologies that that support KM include artificial intelligence (AI) technologies used for knowledge gaining and case-based reasoning systems, electronic discussion groups, decision support systems, expert systems, management information systems, videoconferencing, and information repositories such as best practices databases and lessons learned systems.[17]

KM in healthcare

Healthcare knowledge management (HKM), both as an emerging research theme and a pragmatic practice, aims to manage healthcare knowledge to address the knowledge gaps inherent within a healthcare system.[18] In today's multifaceted environment, it is rapidly becoming indispensable for healthcare organizations to effectively manage their knowledge which is generated internally and externally so as to provide the best possible healthcare, achieve operational excellence, and nurture innovation. HKM can be characterized as the systematic creation, modelling, sharing, operationalization and translation of healthcare knowledge to improve the quality of patient care. The goal of HKM is to promote and provide optimal, timely, effective and pragmatic healthcare knowledge to healthcare professionals (and even to patients and individuals) where and when they need it to help them make high quality, well-informed and cost-effective patient care decisions.[19] Medical textbooks, journals, patient records and other reference materials are widely consulted in the development of care guidelines and treatment protocols in order to compile medical knowledge into operational form. KM approaches in health care are required to capture and respond to more of the critical knowledge needed to ensure public health preparedness; manage and integrate the information that already exists through indexing, cross-referencing and sharing; enable virtual teams to work collaboratively with access to shared knowledge at local, national and global levels. WHO recognizes that, KM aims to bridge the knowledge gaps in global health.[7]

In healthcare systems, KM blends people, technology and processes to create, share, translate and apply knowledge to create value and improve effectiveness. People are who create, share, and use knowledge, and who collectively comprise the organizational culture that nurtures and stimulates knowledge sharing. The user community (for example: employees, doctors, researchers, patients, etc.) share, understand and contribute knowledge through their experiences.[20] Processes are methods to acquire, create, organize, share and transfer knowledge. Technologies are the mechanisms that store and provide access to data, information, and knowledge created by people in various locations.[7] Studies have revealed that main advantages of KM in Health care system are; medical error reduction, improvement of cooperation and innovation, improvement of quality of care, health cost reduction, improvement of health knowledge organization and health organizational learning while main challenges are dearth of KM expertise in health system, low awareness and lack of integration with other IT based media.

Technologies to KM in health care

KM technologies support strategies, processes, methods and techniques to create, disseminate, share and apply the greatest knowledge, anytime and anyplace, across the health care systems. The arrival of Health Information Technology, e-medicine, Tele-medicine, Community of Practice (CoP), mobile clinics and global medical tourism have all support the need to improve the usage and practice of KM in the health sector. Interestingly, this has created a paradigm shift, largely driven by the unique demands of different healthcare stakeholders, where each stakeholder manifests a specific knowledge need, usage pattern and expected outcome.[18]

Technology enables knowledge to reach practitioners, clients and other stake holders regardless of their physical space and geographic locale. It provides avenues for those who cannot be "in the room" to be part of the conversation as it is happening.[21] It is an influential enabler that provides knowledge for concerned bodies which in turn helps to organizational success.[12]

In recent times, progress in different technologies provides KM competences that were not possible previously.[8] Technology can help individuals in health care organizations to be more effective at accessing and sharing their knowledge remotely, while others are used to create or discover knowledge. The increasing use of information and communication technology (ICT) has emerged as a key tool to drive efficiency and effectiveness in health care systems.[7] For example, Phone calls, video-conferencing, webinars, groupware, intelligent agents, K-logs, Wikis, weblogs, and social media are technologies which enable people to enrich knowledge exchange by opening up their discussions to a wider audience. Groupware and intranets technologies are widely used for accessing and sharing knowledge. Applications and collaborative tools including content management technologies such as Taxonomies, Thesauri, and Search engines and portals are also used to ensure that users can easily and quickly find the information they need. Internet portals are the most commonly used tools that allow online health information searchers to be better informed and connected with other like-minded people.[8] These technologies also enable

knowledge users for collecting, organizing, retrieving and using contents. On the other hand data mining technologies are aimed at supporting the creation of knowledge from health care data.[2] Electronic publishing, on CD-ROM or via the internet is also a dynamic concept which is used to enhance equitable access to health information, whether as a replacement for traditional publishing or to supplement it. The strategic objectives of electronic publishing is to reducing costs, disseminating information quickly and widely and providing dynamism in knowledge sharing.[7] Largely, using ICT in healthcare KM can improve health care process measures across diverse settings. With the widespread adoption of electronic health records (EHRs), the availability of advanced analytical tools, and an emphasis on value production, data-driven healthcare will dominate the next decade. As this transformation unfolds, the effective management of knowledge will become an essential skill that all healthcare providers will need to master.[13]

CONCLUSION

For healthcare organizations to stand at a position of attaining a competitive advantage and to scale up their performance, it has got a mandate to be the habit of managing their personal and organizational knowledge in both internal and external environment. This can be realized through the establishment and integration of KM technologies. Computer based technologies, such as ICT for health care KM is a cross-cutting activity connecting together all functions of the health system. These technologies should work together with people and processes to bring the expected health outcomes efficiently and effectively.

There are a number of valuable technologies that can be used to directly support km goals, including: the discovering, capturing, collecting, organizing, sustaining, sharing, and utilizing of knowledge. ICT tools have also a great potential in creating collaborative environment in the entire health systems. From this study it is concluded that ict is a proper vehicle to support people and processes so as to facilitate KM practices in the health care system.

REFERENCES

1. Joseph D, Eswaran S. Knowledge Management Organizational and Technological Dimensions, Selected Papers from the Carnegie Bosch Institute Workshop on "Knowledge Management and the Global Firm. Organizational and Technological Dimensions" held in Sydney, Australia, Library of Congress Control Number. 2006.
2. National Library for Health. Knowledge Management Specialist Library, ABC of Knowledge Management. 2005.
3. David R. Knowledge Management for Health Care Procedures. Library of Congress Control Number. 2007.
4. Chugh M, Chugh N, Punia A, Agarwal DK. The role of information technology in knowledge management. Conference on Advances in Communication and Control Systems. 2013.
5. Dwivedi A, Bali RK, James AE, Naguib RNG, Johnston D. Merger of knowledge management and information technology in healthcare. Opportunities and challenges, Conference Paper in Canadian Conference on Electrical and Computer Engineering. 2002.
6. Ehsan B, Mohammad M, Hani S, Zeinab S. Mahmoud M. A case study of implementing knowledge Management system in healthcare in Malaysia. Int J Res Manag Tech. 2012;2(5):2249-9563.
7. Gbola O. ICT Support for Knowledge Management in Primary Healthcare. A Case Study of Partnership for Reviving Routine Immunization in Northern Nigeria. Library Philosophy and Practice (e-journal). 2012;746.
8. Association of State and Territorial Health Officials, Knowledge Management for Public Health Professionals. 2005.
9. World Health Organization. Technical paper on Regional strategy for knowledge management to support public health Regional Office for the Eastern Mediterranean, Regional Committee for the Eastern Mediterranean. Fifty-third Sessions, Agenda item 8 (c). 2006.
10. Gjorgji M. Strategic and knowledge management in healthcare organizations. Original scientific paper. Research in Physical Education, Sport and Health. 2015;4(2):129-34.
11. Jackson O. Use of Information Communication Technologies in Knowledge Management; 2012.
12. Asian Productivity Organization, Knowledge Management Tools and Techniques Manual. 2010.
13. Jelena RA, Vesna B. VK, Mojca IS. The Impact of Knowledge Management on Organisational Performance. Economic Business Review. 2012;14(2):147-68.
14. Irma B, Rajiv S. Knowledge Management Systems and Processes. Library of Congress Cataloging-in-Publication Data. 2010.
15. Yohannes K, Fredy J, Natalia L. The Knowledge Management Maturity Model for Indonesian Hospital. Int J Recent Tech Engineering. 2019;8(3)2277-3878.
16. John H. Knowledge Management in Healthcare. It's More Important than YouRealize. 2014.
17. Maria M, Ian Jay. Knowledge Management Model for Information Technology Support Service. ©Academic Conferences Ltd.2009.
18. Bolarinwa OA, Salaudeen AG, Akande TM. Overview of Knowledge Management Applications in Health Care Delivery of Developing Countries. Acad Res Int. 2012;3(3):22239944.

19. David R. Knowledge Management for Health Care Procedures. From Knowledge to Global Care. AIME Workshop. 2007.
20. Victor HMG, Lina MME, Edwin RT. Integral Knowledge Management System in Health. 2018;6:368-79.
21. Ysongo W. using technology to support Knowledge Management. 2016.