International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

The Role of Network Layers in Supporting Knowledge Management Implementations

Ayad Shihan[1], Luay Kadhum[2], Nor'ashikin Ali [3]

Universiti Tenaga Nasional, College of IT , Kajang, Selangor, Malaysia

Abstract: ***Knowledge management (KM) approach has been adopted in virtually every business unit in organizations as a means to improve the competitive advantages of organizations. The benefits of KM in maximizing resources and at the same time minimizing costs are two important economic advantages of knowledge management. The organizations focus on how to improve the knowledge management implementation through adopting efficient knowledge management processes to manage the explicit and tacit knowledge. Most researchers focus on managing knowledge activities using IT services based on the interrelation between knowledge management processes. Knowledge management processes can be managed by having the architecture of IT infrastructure, i.e. network layers to provide effective integration between knowledge management layers and the architecture of IT infrastructures. This paper focuses on managing the knowledge processes based on network layers rather than IT services to maximize the management performance of knowledge implementations. The literature review is the main basement of this research. The knowledge management processes could be integrated efficiently depending on three main network layers; service agreement layer, management agreement layer, and infrastructure layer.***

Keywords: Knowledge Management, Knowledge Adoption, Network Layers, IT

1. Introduction

Organizations adopt the knowledge management implementation to manage knowledge resources inside working environment in order to maximize business income and minimize waste resources so that the competitive advantages of businesses could be developed. Knowledge management is responsible to manage the explicit and tacit knowledge efficiently by minimizing the difficulty of transferring the knowledge in order to provide the right solution of knowledge at the right time to support the working activities [1]. However, there are many practical visions of knowledge management processes.

Nowadays, IT systems (IT services and infrastructures) are adopted to improve the traditional systems performances, i.e. paper-based systems. IT systems provide many advantages such as reduce the information processing time, minimize the requirements costs of traditional systems, and maximize the management performance of complex environment. IT is considered as an important solution to support knowledge management implementation by providing adaptive and automatic services using efficient infrastructures and applying the processes of knowledge management. IT systems have two main dimensions; (1) services or applications, and (2) infrastructures or physical objects. The researchers of KM implementations focus on managing the KM processes based on IT applications. However, the IT infrastructures play important roles in management issues such asthe network management layers.

The main aim of the KM implementation is to pass the right knowledge to the right person and at the right time [1]. Thus, knowledge resources such as tacit and explicit resources need to be managed effectively to address the aims of KM. [2] mentioned that there are many aspects of KM; (1) People knowledge, i.e. tacit knowledge, (2) documents knowledge, i.e. explicit knowledge, and (3) knowledge implementation, i.e. knowledge activities. On the other hand, there are many dimensions to ensure the knowledge value; (1) knowledge accuracy and (2) knowledge quality [3]. Knowledge contents change rapidly due to the rapid increase of knowledge sources. Thus, it is difficult to share the right knowledge to the right person and at the right time using the traditional knowledge management methods such as paper-based systems [4].

[5] argued that one of the main advantages of IT systems is the ability to manage the complex environment efficiently. KM has complex processes due to the complexity of KM implementation [6]. Therefore, IT services and infrastructures are considered as a responsible solution of KM implementation. The main aim of this paper is to investigate the role of network management layers for the success of KM implementation in supporting the decisions of KM systems adoption in organizations working environments in order to achieve the competitive advantage of knowledge over other organizations.

2. Knowledge Management

Knowledge is defined from many perspectives based on the role of knowledge. [2] defined knowledge as an insight of information inside working activities to support the value of business. The main basement of information is the data. The information is the relation between data to formulate clear and usable contents. On the other hand, [7] defined knowledge as the value added to the business activities through real implementation of knowledge inside the working environment. Moreover, [8] argued that knowledge is the relation between accurate information and working activities. [9] mentioned that accurate knowledge of employees maximizes the performance of working activities. Thus, the return benefits of businesses will increase. Accurate working activities ensure customers' satisfaction. [10] argued that accurate knowledge supports the discovering of new

solutions to avoid the challenges of dynamic working activities. Accurate knowledge improves the competitive advantage of the businesses over other competitors in the market.

[2] defined KM as the process to collect, manage and share knowledge in order to ensure the outcomes of organizations performance. [11] mentioned that KM is a necessary process to add the value chain of knowledge to maximize the competitive advantages of organizations. On the other hand, [12] defined KM as "sequence processes of collecting, creating, capturing, retrieving, designing and sharing knowledge to support the applicable activities of the organizations". [13] explained that KM is the process that manages the tacit and explicit knowledge inside working environment to share the right knowledge to the right employees. Figure 1 illustrates the tacit and explicit knowledge transfer and sharing.

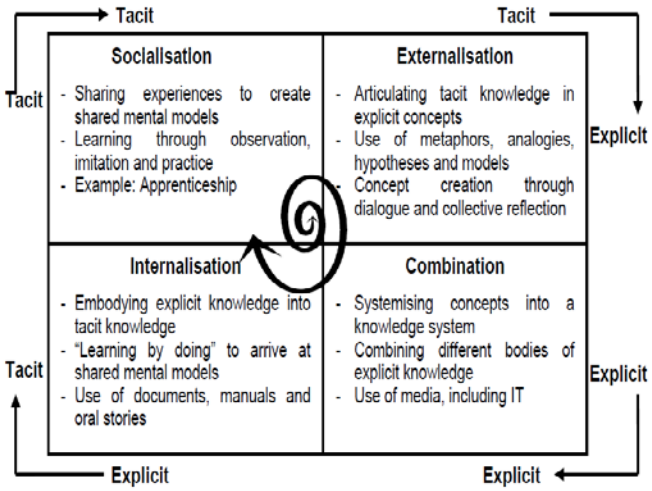

Figure 1: Knowledge transfer and sharing

Working environment is complex by default. The working environment is dynamic and the provided services are changed continually [14]. Knowledge is an important key to ensure efficient services and performance. There are many dimensions of knowledge that maximize the difficulty to share the right knowledge to the right employees and at the right time; (1) large volume of knowledge sources either explicit or tacit resources, (2) employees have different roles and need knowledge to maximize the difficulty in determining the suitable knowledge for each employee, and (3) the services dynamicity requires continuous maintenance of knowledge to address new challenges of working responsibilities [15, 16]. KM is responsible for managing the knowledge dimensions and efficient implementations through sequence of processes to provide valuable and accurate knowledge to satisfy the employees' needs of knowledge based on their working activities. Thus, KM maximizes the management performance of complex knowledge environment [17]. KM is an efficient approach to manage the knowledge implementations inside working environment. However, there are many success factors that can be found to ensure the efficiency of knowledge management processes. IT factor is an important factor that supports the KM implementations [1, 18, and 19].

3. Knowledge Management Processes

The researchers developed many frameworks to cover the phases and processes of KM. However, there is no standard framework of KM to be adopted by the organization in different sectors. The following points are considered as the most efficient KM phases and processes [20 and 21]:

- Knowledge Sharing Phase: there are two main processes of this phase; (i) pull processes to determine the current statuses of tacit knowledge needs such as skills and expertise levels using knowledge measurement methods and to determine the employees' needs of explicit knowledge to develop their tacit knowledge using suitable searching criteria such as search engines, and (ii) push processes to retrieve the explicit knowledge from knowledge base based on the pull processes determinants.
- Knowledge Identification: this phase is responsible for managing and identifying the suitable explicit knowledge based on the determinants of the pull processes in knowledge sharing phase.
- Knowledge Collecting: this phase focuses on collecting accurate knowledge efficiently from knowledge base and depends on the knowledge identification phase. There are two main styles to collect explicit knowledge; (i) select explicit knowledge from internal knowledge base, and, (ii) create database which discovers and selects explicit knowledge that is not available in knowledge base from external sources such as Internet or other organization knowledge bases.
- Knowledge Retrieving: this phase retrieves and prepares the selected knowledge to be pulled through knowledge sharing phase. There are four main processes of this phase in order to prepare and formulate the final version of explicit knowledge, as well as update the explicit and tacit knowledge statuses; (i) design the selected knowledge in simple and clear forms, (ii) codify the created knowledge and store it in knowledge base, (iii) check the integration between tacit knowledge, explicit knowledge and organization strategies, and (iv) update the tacit and explicit knowledge map based on the employees feedbacks.

4. Role of it System to Support Knowledge Management Implementations

[1, 19, and 20] analyzed the most important success factors of KM implementations. According to the findings of the studies, IT system is necessary to maximize the accuracy of the performance of KM implementations. IT provides wide opportunities to develop and maintain new visions of KM implementations.

According to the studies by [22, 23, 24, and 25], IT system is important to support KM implementations for many reasons, such as:

- Reduce the cost and time requirement: traditional KM approaches such as paper-based systems require high level of effort, physical material, and time execution to manage the knowledge dimensions efficiently. IT system could reduce these requirements using electronic services and infrastructures.

- Maximize the accuracy of KM performance: Manual implementations of KM may have execution mistakes and errors, which minimize the performance of KM. IT system provideshigh level of execution accuracy of KM. However, careful analysis and design of the IT system are required.
- Save knowledge: Organizations face challenges in saving valuable tacit knowledge i.e. experts'skills from being lost. IT services support continuous recording of tacit knowledge by transferring the knowledge to explicit knowledge that are stored in electronic repositories. Efficient IT services that support effective recording methods are required.
- Produce adaptive solutions: There are many approaches and methods such as AI methods that can be applied to analyze the current knowledge and produce intelligent solutions of knowledge to address any new business challenge. The new solutions could be created adaptively in real time based on working environment changes.
- Support observation of knowledge activities: Knowledge can be maintained and updated to address organizations strategies. IT system can produce reports based on in-depth analysis by supporting electronic observing of knowledge activities and the gained benefits. Thus, the organization can adopt new solutions of knowledge to maximize the performance of working activities.

5. Network Management Layers

- [26] argued that there are three main layers of IT networks, which are:
- Service Layer Agreement (SLA): this layer provides applications or services to end users, which can be accessed through networks from various users, i.e. online application using web browsers.
- Management Layer Agreement (MLA): this layer processes and manages the information flow between SLA and Infrastructure Layer
- Infrastructure Layer (IL): this layer represents the infrastructures that require storing i.e. repositories; transferring, i.e. network; and processing, i.e. CPU's information and services.

6. Related Works

[23] designed IT tools that collaborate employees with each other to support the KM implementation in various types of corporations; (1) publications structuring tool, i.e. structured or semi-structured publications, (2) knowledge search, i.e. search engines (3) knowledge integration, i.e. evaluation of knowledge, (4) knowledge presentation, i.e. display links of documents, (5) knowledge transfer, i.e. transfer from external sources, (6) communication and cooperation, i.e. emails and blogs, and (7) administration of knowledge, i.e. reports. Figure 2 illustrates the collaboration tools to support KM implementations.

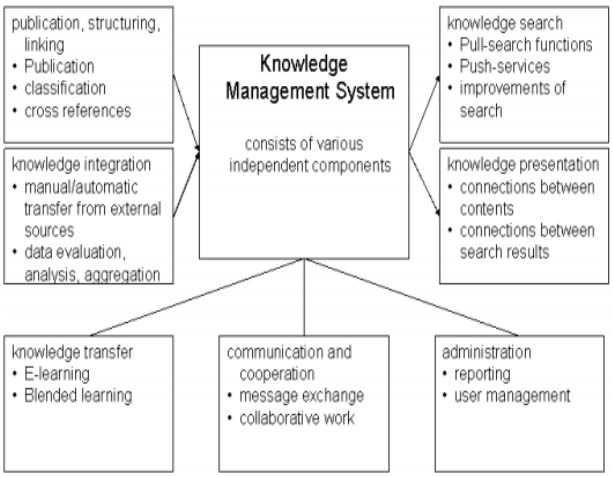

Figure 2: Collaboration tools [23]

[24] developed an intelligent agent to analyze the workflow of KM in organizations in order to support the needs of knowledge in and maximize the performance of organizations working activities. The developed agent is responsible for tracking the KM processes and implementation before evaluating the performance of KM activities. Weak activities are analyzed and maintained adaptively by maintaining the KM services and knowledge contents that are gathered through these services. Figure 3 shows the conceptual intelligent agent dimensions.

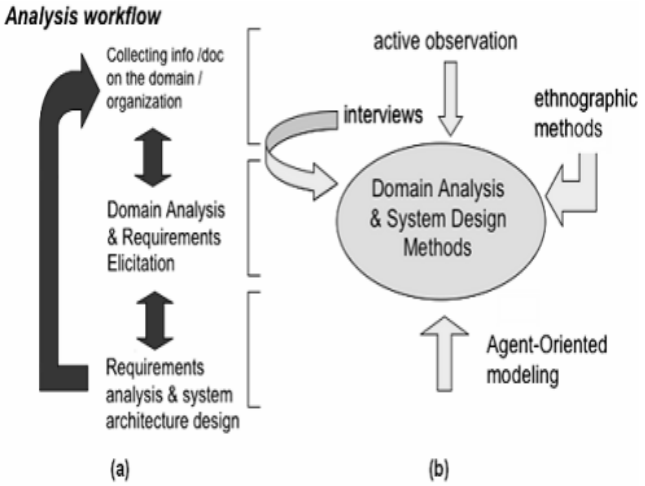

Figure 3: IT agent to analyze workflow [24]

[25] developed a tool to support the employees' feeding of knowledge either from explicit or tacit sources of knowledge in order to develop the tacit knowledge of employees by maximizing their performance of working roles. The tool contains 4 main services; (1) Add/store knowledge from various resources, (2) Edit the stored knowledge, (3) Allow the employees to search the needed knowledge, and (4) Notify the users about any new added knowledge. The employees' needs of knowledge are evaluated adaptively before selecting or producing the necessary knowledge for them. Figure 4 presents the developed tool.

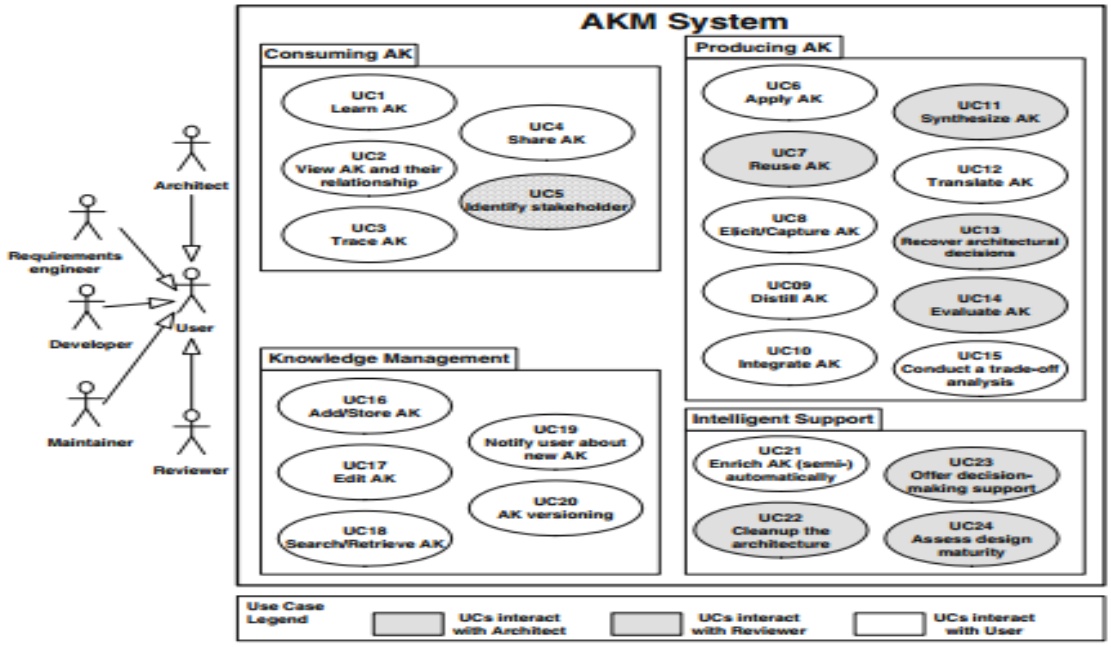

Figure 4: Tool of knowledge supporting [25]

Table 1 presents other related works of KM that support IT methods.

Table 1: Related works of IT supporting KM

Source	Main Aim	IT Role
[27]	"To analyze and design a practical knowledge management system for SDIC/CAAS in order to increase the integrated competitive ability of the organization through knowledge sharing and raise the level of procession of knowledge assets in the whole organization on a cost effective"	1. Develop IT services and infrastructures to support KM implementations. 2. Develop search engine tool to search and access the knowledge. 3. Identify the knowledge dimensions to collect or create knowledge solutions. 4. Knowledge sharing and evaluation electronically.
[28]	To develop a value engineering knowledge management system (VE-KMS), apply the theory of inventive problem-solving and integrate its creativity tools into the creativity phase of the VE process and thus makes the creativity phase more systematic, organized and problem-focused.	ICT supporting (systematic infrastructures) to: Step A: Collect project explicit knowledge. Tacit and explicit knowledge measurement of Value Engineering (VE), i.e. tacit knowledge of engineers. Step B: Break project into subsystems. Step C: Identify harmful functions in each subsystem. Step D: Identify and solve technical contradictions. Step E: Identify and solve physical contradictions. Step F: Conduct substance-field analysis.
[29]	"To design knowledge service and framework of KMS for web-based learning and to set forth technical details for KMS implementation for Tsinghua university"	Apply ICT to: 1.Knowledge creation and storage. 2.Knowledge acquisition: ubiquitous knowledge. 3.Knowledge integration and organization. 4.Knowledge transfer and sharing.

7. Discussion of Related Works

According to the related works, IT services and infrastructures have important roles in knowledge management implementation; Table 2 shows the IT layers responsibilities based on KM activities.

Table 2: The IT layers responsibilities based on KM activities

Source	*KM Activity*	*IT Activities*	*Proposed Layer of IT Network*
[23, 24, 25, and 29]	Identify Knowledge	Determine the employees' needs of knowledge, i.e. search engines.	SLA
[24, 25, and 29]	Acquire Knowledge	Acquire the needed knowledge from available tacit and explicit resources, e.g. collectors and agents.	MLA + IL
[23, 27, 28]	Knowledge Integration	Ensure the integration between employees' need and the acquired knowledge, i.e. adaptive tacit and explicit measurement methods.	MLA
[24, 25, and 28]	Select or Create Knowledge	Select knowledge if the internal resources, i.e. knowledge base are enough to satisfy the employees' needs of knowledge. Otherwise Create knowledge solutions, i.e. data mining and machine learning methods.	MLA + IL

[23 ,25, and 29]	Retrieve Knowledge	Retrieve knowledge from the resources using efficient displaying design,i.e. XML design structure.	MLA
[23,25, and 29]	Share Knowledge	Share the knowledge to employees through available gates, i.e. web pages.	SLA
[23 and 29]	Transfer Knowledge	Provide IT service to transfer the knowledge from one form to another (tacit and explicit), e.g. document the tacit knowledge using electronic feedback forms and collaboration with blogs to transfer the tacit knowledge to other tacit.	SLA+ MLA+ IL

8. Conceptual Design of Network Layers to Support KM Activities

Figure 5 illustrates the conceptual design of IT layers integrated with KM activities based on the discussion of Table 2. (1) End users can identify their need through suitable tools. (2) The knowledge can be selected or created from available resources. (3) The integration between the selected knowledge and employees' needs could be addressed. (4) The knowledge retrieved based on efficient structure. (5) The knowledge shared to end user. On the other hand, the knowledge can be transferred between the end users to each other and between the end users and explicit knowledge.

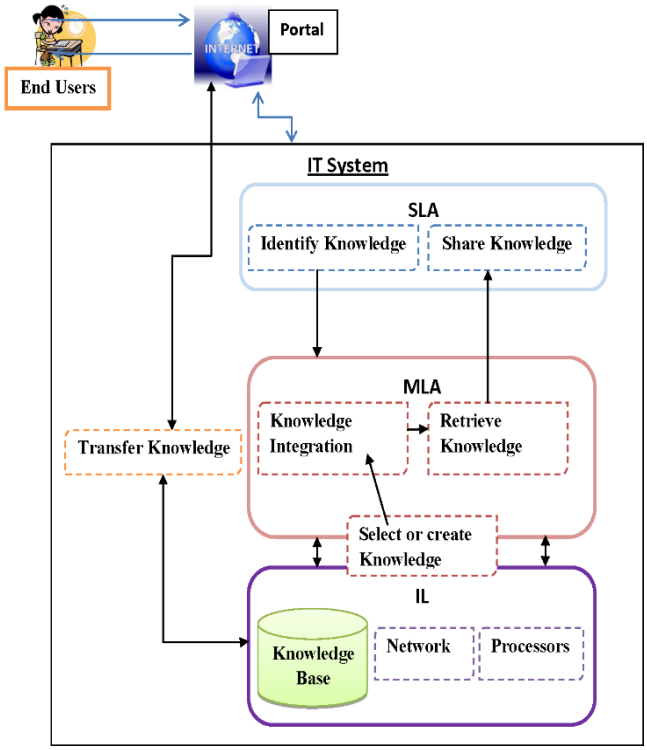

Figure 5: Illustrates the conceptual design of IT layers integrated with KM activities

There are three main network management layers are adopted to manage the various processes of KM. SLA layer could be efficient to manage the knowledge identifications and sharing. MLA could be efficient layer to manage the knowledge integration and retrieving. IL could be efficient to manage the knowledge systems infrastructures such as knowledgebase and networks. The knowledge transferring is a general processes can be executed through combination between most of KM processes in various layers.

9. Conclusion

Organizations face challenges of managing knowledge management processes efficiently in order to ensure the working activities' performance of accuracy. KM is an efficient approach to manage the knowledge implementations inside working environment in order to add value of businesses profits and minimize waste resources. The accurate and efficient knowledge management improves the competitive advantages of organizations. However, the traditional systems of KM such as paper-based system have many drawbacks. IT systems are efficient solutions to maximize the KM performance. Most researches focus on managing the knowledge activities using IT services based on the interrelation between knowledge management processes. Knowledge management processes can be managed depending on the architecture of IT infrastructure i.e. network layers to provide effective integration between knowledge management layers and the architecture of IT infrastructures. There are many IT services, infrastructures, and methods that can be adopted to provide high management level of knowledge in order to support the organizations activities. Network management layers can be adopted to manage the activities of KM efficiently.

10. Future Scope

In future more work can be done to validate the conceptual design by doing quantitative data research on knowledge management integrating with network layer in organization. This would help the organizations in using a strong management processes to improve the knowledge management adoption.

References

[1] Debowski, S (2006), Knowledge Management, John Wiley & Sons, Milton, Queensland, Australia.
[2] Alavi, M &Leidner, DE (2001), 'Review: knowledge management and knowledge management systems: conceptual foundations and research issues', MIS Quarterly, vol. 25, no. 1, pp. 107-36.
[3] Robert.S, (2013). "PARAMETRIC EXPLICIT KNOWLEDGE MAPPING IN A LEARNING ENVIRONMENT". Management and learning international conference 2013. Zadar, Croatia.
[4] Bollinger, AS & Smith, RD (2001), 'Managing organizational knowledge as a strategic asset', Journal of Knowledge Management, vol. 5, no. 1, p. 8-18.
[5] Walters, D, Halliday, M & Glaser, S (2002), 'Creating value in the "new economy", Management Decision, vol. 40, no. 7/8, p. 775-81.
[6] Yaghoubi, N. M., &Maleki, N. (2012). Critical Success Factors of Knowledge Management.

[7] Shankar, R, Singh, MD, Gupta, A &Narain, R (2003), Strategic planning for knowledge management implementation in engineering firms', Work Study, vol. 52, no. 4, pp. 190-200.
[8] McElroy, MW (2003), The New Knowledge Management: Complexity, Learning, and Sustainable Innovation, Butterworth-Heinemann, USA.
[9] Bartes, F. (2009). Paradigmainovací a hodnotovéinženýrství. Brno: VÚT.
[10] Hana, U. (2013). Competitive advantage achievement through innovation and knowledge. Journal of Competitiveness, 5(1), 82-96.
[11] Manovas, M (2004), 'Investigating the relationship between knowledge management capability and knowledge transfer success', Master of Science thesis, Concordia University.
[12] Kongpichayanond, P. (2009), 'Knowledge management for sustained competitive advantage in mergers and acquisitions', Advances in Developing Human Resources, vol. 11, no. 3, pp. 375-87.
[13] Massa, S &Testa, S (2009), 'A knowledge management approach to organizational competitive advantage: Evidence from the food sector', European Management Journal, vol. 27, no. 2, pp. 129-41.
[14] Roberta Katz. (2006). "Change Management and StrategicPlanning", Associate Vice President of StrategicPlanning, Stanford University.
[15] James, P (2005), 'Knowledge Asset Management: The Strategic Management and KnowledgeManagement Nexus', DBA thesis, Southern Cross University.
[16] David Skyrme Associates. (2011). "Knowledge Management Roles", founded at http://www.skyrme.com/kmroadmap/roles.htm.
[17] International Competition Network , (2012) ." Effective Knowledge Management", Draft of book, chapter 3.
[18] Monavvarian, A., &Khamda, Z. (2010). Towards successful knowledge management: People development approach. Business Strategy Series, 11(1), 20-42.
[19] Razi, M. J. M., & Abdul Karim, N. S. (2010). An instrument to assess organizational readiness to implement knowledge management process. Knowledge Management: Theory, Research & Practice, Proceedings Knowledge Management 5th International Conference, 23-328.
[20] Lee, YC & Lee, SK (2007), Capability, processes, and performance of knowledge management: a structural approach", Human Factors and Ergonomics in Manufacturing, vol. 17, no. 1, pp. 21-41.
[21] Nguyen, T. N. Q. (2010). Knowledge management capability and competitive advantage: an empirical study of Vietnamese enterprises.
[22] Basu, B., &Sengupta, K. (2007). Assessing success factors of knowledge management initiatives of academic institutions–a case of an Indian business school. The Electronic Journal of Knowledge Management, 5(3), 273-282.
[23] Schmaltz, R., Hagenhoff, S., &Kaspar, C. (2004). Information technology support for knowledge management in cooperations. Institute Of Information Systems, Dpt. II, University Of Goettingen, Germany.
[24] Guizzardi, R. S., & Perini, A. (2005). Analyzing requirements of knowledge management systems with the support of agent organizations. Journal of the Brazilian Computer Society, 11(1), 51-62.
[25] Liang, P., &Avgeriou, P. (2009). Tools and technologies for architecture knowledge management. In Software Architecture Knowledge Management (pp. 91-111). Springer Berlin Heidelberg.
[26] Rimal, B.P., Choi, E, Lumb, I. (2009) "A Taxonomy and Survey of Cloud Computing Systems," Networked Computing and Advanced Information Management, Fifth International Joint Conference on INC, IMS and IDC , pp. 44 51.
[27] Sijing.L (2011). Analysis and Design of Knowledge Management System A Case Study —Analysis and Design of Knowledge Management System in SDIC/CAAS. Scientech Documentation and Information Centre(SDIC), Chinese Academy of Agricultural Sciences(CAAS), 100081,Beijing, P.R. China.
[28] Zhang, X., Mao, X., &AbouRizk, S. M. (2009). Developing a knowledge management system for improved value engineering practices in the construction industry. Automation in construction, 18(6), 777-789.
[29] Peng, J., Jiang, D., & Zhang, X. (2013). Design and Implement a Knowledge Management System to Support Web-based Learning in Higher Education.Procedia Computer Science, 22, 95-103.

Author Profile

Ayad Shihan Izkair is studying Master of Information Technology (Coursework and Research) at Universiti Tenaga Nasional in Malaysia. He received his BSc. Degree in Computer Science from University of Technology, Baghdad-Iraq in 1994, and a Master of Computer Science from ST. Clements University in Iraq in 2008. He worked as a teacher in Libya from 1997 to 2000 and as a programmer and a teacher in UAE from 2002 to 2003. He worked with international organizations in Iraq from 2003 to 2012 in different positions, his last positions were IT manager and M&E Systems Manager.

Luay Mohammed Ridha is currently studying Master of Information Technology (Coursework and Research) at Universiti Tenaga Nasional in Malaysia**.** He received his BSc. Degree in Computer Science from Al-Mansoor University Collage , Baghdad-Iraq in 1997. He is network administrator of University of Kufa. His research interest includes Networks management in education and Iraqi public sectors.

Dr. Nor'ashikin Ali is currently a senior lecturer in Department of Information Systems, College of Information Technology, Universiti Tenaga Nasional, in Malaysia. She received her Bachelor of Computer Science from Texas State University, San Marcos, Texas, USA, and a Master of IT in Business from University of Lincolnshire-Humberside, UK. She holds a Ph.D. from Massey University, New Zealand in the area of knowledge management with particular focus in healthcare. Her research interest includes knowledge management in healthcare and Malaysian public sectors. She has received a grant to conduct research in knowledge management in telehealth. Currently she also involves in knowledge management consultancy project in Malaysia..