A Knowledge Sharing System Architecture for Higher Education Institutions

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Abstract. This paper describes the development of a knowledge sharing system architecture based on the knowledge sharing behavior (KSB) of real academicians in public institutions. Semi-structured interviews were conducted with 22 academics who work in Saudi universities to investigate current academics' KSB and explore academics' needs for a new knowledge management system (KMS). An inductive content analysis approach was used to help the researchers to extract themes that were frequently mentioned by the interviewees. The analysis and findings will expand an area of KMS in academic institutions, particularly universities which might still theoretically and empirically not sufficiently covered.

Keywords: Knowledge management · Knowledge sharing knowledge management systems

1 Introduction

Recently, knowledge has been increasingly recognized as one of the most valuable assets of an organization, and as a source of competitive advantage [1]. The emergence of the knowledge-based economy has emphasized knowledge management (KM) as a key to organization performance. While KM has been implemented in a large number of sectors and organizations [2], universities and the higher education sector are yet to take full advantage of the capabilities offered by KM. Rowley [3] notes that higher education institutions (HEIs) are part of the knowledge business, since they are involved in knowledge creation, dissemination and learning. Faculty produce significant amounts of teaching experiences and materials as a result of teaching activities. Previous research has mentioned that managing teaching experiences can facilitate access to published knowledge sources within the academic community, increase the overall teaching quality, enhance academics' development efforts, and reduce workload. A practical approach to managing the different types and sources of knowledge used by academics is by sharing knowledge, and previous studies have highlighted that academic institutions face challenges in attempting to improve the sharing of teaching-related knowledge. Without the sharing of knowledge, academics will continuously reinvent themselves, and there will be no way of leveraging experience and expertise. Therefore, such institutions need to adopt a proactive approach to KM whereby

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instructors can create, transfer, share and then apply teaching experience effectively [4]. A Knowledge Management System (KMS) can provide a technological solution to enhance knowledge sharing processes, and consequently boost the application of knowledge in order to improve performance and outcomes in public institutions [5, 6]. However, Samoilenko and Nahar [7] have pointed out that existing off-the-shelf KMSs often fail due to inappropriate tools or insufficient understanding of human behavior. The human dimension of knowledge sharing has been neglected in much of the literature [7] even though the way in which academics create, transfer and manage knowledge is more important than the technological aspect [8]. According to Loucopoulos and Karakostas [9], it is important for academic institutions, which are knowledge-based organizations, to understand their employees' knowledge sharing behavior (KSB) and to attempt to develop a knowledge sharing system that is compatible with their KSB. KSB refers to how, and how much, an individual shares knowledge with others [10], and differs depending on the type of knowledge involved and the use being made of it.

Few researchers have explored KSB in academic institutions [7]. Given the current situation, this research aims to answer the following research question: How can a KMS architecture framework be developed based on academics' knowledge sharing behavior?

This paper is organized as follows. Previous studies relating to KMSs are reviewed in the Literature Review section. The Methodology section describes the qualitative approach used in this research. Then the proposed knowledge sharing system architecture is presented in the Findings section. The final section presents the conclusion and future research.

2 Literature Review

2.1 Knowledge Management System (KMS)

Although there appears to be no universal definition of KMS, many researchers define a KMS as an IT-based system developed to promote organizational knowledge by enhancing the capturing, storage, retrieval, sharing, and application of knowledge to increase individual productivity and innovation [11]. Alavi and Leidner [12] define KMSs as "a class of information system applied to manage organizational knowledge". For the purposes of this study, a Teaching Practices Management System (TPMS) is defined as an IT-based system which *supports and enhances the creation, storage/retrieval, sharing and application of teaching experiences among academics in universities*. Many benefits can be generated from implementing a TPMS in academics institutions, such as supporting knowledge sharing activities, encouraging employee collaboration, and facilitating access to experts and expertise [6, 13].

The architecture of a system plays a vital role in managing complex interactions among end-users [14]. It also "facilitates early analysis of the system, especially with respect to quality attributes and maintainability of the system" [15]. The system architecture is about a shared understanding of a system's design, the major components of the system and the way they interact [16]. Although some architectures have

even been designed to help in the development of KMS, most of them focus on a particular domain and can only be used under specific circumstances. In addition, they do not consider the cycles of knowledge in order to use knowledge management in the system itself. For that reason, a TPSM architecture was developed based on the actual KSB of a sample of academics in a public institution.

3 Methodology

Since the aim of this study is to comprehensively investigate authentic academics' knowledge sharing behavior and incorporate it into the design of a KMS architecture, a qualitative approach was considered most appropriate. According to Myers and Newman [17], a semi-structured interview is a useful data collection method in information system studies because it provides opportunities to explore a topic in more depth. The researchers applied a convenient sampling technique in choosing the respondents. The interviews were conducted with 22 academics (five heads of departments, five assistant professors, eight lecturers, four teacher assistants) who work in Saudi universities. These participants worked in various faculties and disciplines, but they represented a homogeneous participant group in that all of them were academics. The interviews continued until the participants no longer provided differing information, and data saturation developed in the answers [17]. The qualitative data resulting from the academics' responses were transcribed into a text format, reviewed several times and then uploaded to the MaxQDA software application and analyzed using thematic analysis. An inductive content analysis approach was used to help the researchers to extract themes that were frequently mentioned by the interviewees. The analyzing and coding of responses was done line-by-line.

4 Findings

A comprehensive TPMS Architecture (TPMSA) is proposed to illustrate a new approach for enhancing and facilitating teaching practice sharing based on actual KSB of academics resulted from the qualitative findings. The developed architecture consists of three layers, as illustrated in Fig. 1.

4.1 Knowledge Presentation Layer (KPL)

The KPL is the first layer of the system architecture. It primarily acts as the main gateway for the KMS by enhancing the interface between the knowledge worker and the knowledge resources. At the KPL, instructors and administrators connect and participate in the knowledge management processes by submitting and accessing knowledge resources using a web browser, which represents the access platform and is located on the end-user machine (i.e., client-side). It is supported by the Internet and multiple access platforms which include tablets and smartphones. This layer includes user registration and verification, and to access the systems, the user must enter their username and password.

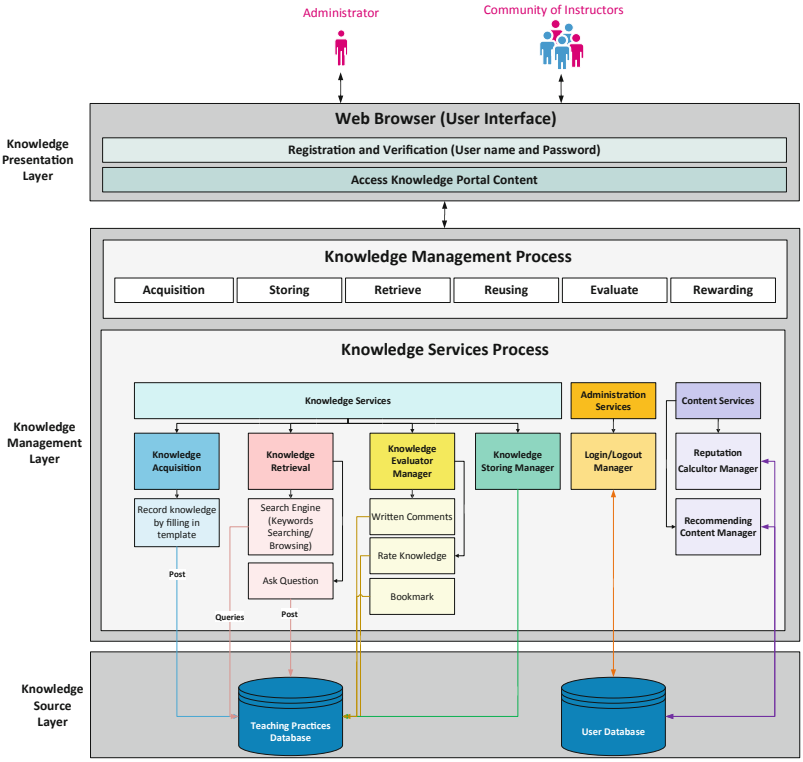

Fig. 1. Teaching practices management system architecture (TPMSA)

4.2 Knowledge Management Processes Layer (KMPL)

The KMPL is the second layer in the system architecture. It aims to support the knowledge management processes identified from the qualitative findings. The supporting services at this layer consist of knowledge, content, and administration services which form the interface for the users. Usage of different technologies is vital to support each of these components.

The knowledge services at this layer include knowledge acquisition, storing, retrieval, evaluating, and rewarding. The knowledge acquisition service enables academics to capture knowledge in a comprehensive format to be easily read and shared by others by employing a template feature [18]. Knowledge retrieval services allow academics to find the required stored knowledge through searching by keywords, browsing the posted teaching practices, or asking direct questions [19]. To evaluate the usefulness of knowledge, the resulting architecture includes a knowledge evaluation service by implementing three direct feedback mechanisms: voting-up rating mechanisms, bookmarks and written comments on posted knowledge [20].

Content services include a recommending content manager, which will suggest content to end-users based on their profile, and a reputation calculator manager which will calculate the reputation points for each participant based on their contribution in

the system. Earning reputation points will motivate instructors to articulate their expertise in teaching and become more involved by sharing their teaching practices with their peers.

Administration services provide the necessary functions to perform the login/logout services for the users. A login manager will validate user login information across database (username and password), while a logout manager will delete all the metadata for the logged-out user.

4.3 Knowledge Source Layer (KSL)

The KSL is proposed to address the need to store and integrate the wide variety of electronic sources. KSL consists of an assortment of knowledge repositories such as teaching practices databases to store content knowledge and users' profiles. The teaching practices database handles sources of explicit knowledge that encompass knowledge objects (e.g., documents and manuals) or tacit knowledge (e.g., academics' expertise). The user database holds all users' information such as username and password.

5 Conclusion

This research contributes to the field of KMS through the development of an innovative teaching practice management system architecture (TPMSA) based on an intensive literature review and upon an understanding of academics' behavior obtained from qualitative findings. A significant limitation of the previous knowledge management systems is that they were developed based on theory disregarding the actual knowledge sharing behavior of end users. This shortcoming is resolved in the proposed TPMSA by conducting interviews with 22 academics who work in universities.

The proposed TPMSA is of great potential importance to a higher education institution that intends to implement a KMS in their organization. It provides a clear, comprehensive, and structured processes for capturing, sharing, searching, and storing teaching practices. Indeed, it is believed that it will become a guideline when designing and implementing a new knowledge sharing system due to the sufficient level of details incorporated in the framework. It will also be likely to assist developers in avoiding the errors and gaining other benefits in terms of time and effort, as well as reducing cost. In future work, a new system will be designed based on the proposed TPMSA, and empirically evaluated.

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