Knowledge Management Initiative for Organizing and Sharing Institutional Learning Resources in Higher Education

By

Cristeta G. Tolentino,
Pangasinan State University
Email: crg.tolentino@gmail.com,

Thelma D. Palaoag
University of the Cordilleras
Email: tdpalaoag@uc-bcf.edu.ph

Abstract

Higher education institutions create, share, and apply knowledge during the teaching and learning processes and activities. Learner-centered knowledge are created by faculty members and shared among students. The adoption of web-based learning management systems and other online technologies facilitates online learning and instruction, primarily since the home-based learning modality was enforced. Digital learning materials are produced and accumulated to intensify the delivery of topics to students in which various online applications are used to store, share, and circulate them to students. However, these tools focus on managing learning activities and circulating digital educational resources and do not support the management of knowledge in an institution. Knowledge management involves the creation, storage, acquisition, and transfer of an institution's explicit and tacit knowledge. This paper has explored accomplished works and literature to support the creation of a framework for a Knowledge Management System that integrates functionalities and services appropriate to the organization and sharing of the institution's learner-centered knowledge. Within this context, this study proposes a framework for a knowledge management system and identifies appropriate features that address the need for knowledge management, which may help accelerate and improve the teaching and learning processes of the institution. The implementation of the framework intends to enhance the creation, storage, and sharing institution's learner-centered knowledge that may be useful in decision-making activities hence promoting and strengthening knowledge creation and sharing culture.

Index Terms. knowledge management, knowledge repository, knowledge services, learning resources

I. Introduction

Higher education institutions (HEI) are crucial actors in the production of knowledge, teaching, and transforming curriculum and teaching to prepare a new generation to address global challenges. HEIs have been incorporating sustainable development (SD) into their systems, curricula, and local communities for more than thirty years [1]. Higher Education Institutions are responsible in guiding students, faculty, staff, and administration [2],[3] and their decisions affect the economic, social, and environmental dimensions of the communities and regions around them [4].

Nowadays, most higher education institutions are virtualizing through e-learning platforms benefitting from their many advantages such as ubiquitous teaching and learning, use of collaborative tools, provision for different learning styles, etc. E-learning is essential for

education because it can intensify the state of the student's learning experience and expand the learning opportunities of every lecturer and tutor. It provides various creative ways of motivating and engaging learners of all abilities, enabling and inspiring everyone to attain their educational potential. E-learning has become an exigence and contributes to higher education institutions and is being deployed in educational establishments throughout the world [5].

Customized forms of software are typically evident in the form of Learning Management Systems (LMS) are used to simulate classroom settings and facilitate academic discussions/ interactions, which tend to enhance the learning process. These e-learning platforms also provide educators with tools to share learning materials, conduct discussions, and track and assess learners' activities. An LMS is a helpful tool for students and teachers in an online learning environment as it is a tool for communication and interaction among students and lecturers. LMS is a helpful content distribution system where instructors can distribute course materials and interact with students at a distance [6].

Like most educational systems, Pangasinan State University (PSU), a multi-campus HEI, migrated to blended learning modality to continue to deliver education to students from different parts of the province. Teaching and learning resources and activities are provided and conducted through different online tools and platforms, which include learning management platforms, chat applications, video conferencing applications, social media, etc. Through these tools, learning can occur anytime and anywhere.

PSU continuously delivers education during the pandemic by resolving to conduct online classes which arose various online tools to reach out to students, distribute learning materials, conduct discussions, administer assessments, exchange viewpoints, and other academic-related activities. Traditionally, knowledge flows from teachers to students through different forms, such as books, presentations, theses or dissertations, technical reports, case studies, manuals, etc. Hence these sources of knowledge should be in their digital form to be able to be shared among students in an online learning setup.

Currently, PSU has numerous learning objects or materials available either on individual faculty's personal computers (i.e., e-books, lecture notes, PowerPoint slides, etc.), on the university's online subscriptions to journals and publishing companies, on the libraries' computers, or on the Internet. Digital learning materials, as defined by the Institute of Electrical and Electronics Engineer's (IEEE) Learning Technology Standards Committee, are entities that can be used, re-used, or referenced during technology-supported learning [7]. This definition is intended to include any form of instructional material or digital asset that the institution use to enable teaching and learning during technology-supported learning. Sharing of these learning materials to students and faculty members was commonly done through various means such as file sharing in chat groups, email, google drive, etc.

At the high point of digital learning materials, teachers in PSU were compelled to obtain and collect digital learning resources from the web, create videos for instruction and demonstration of topics, create presentations to visually impart knowledge to students, and store them in their devices for re-use in all the classes they handle. Various sources from the web are checked to acquire relevant materials that will augment the knowledge of teachers who will teach each course.

In 2020, with the realization of the need to continuously provide quality education despite the challenges brought by the pandemic, the institution contemplated the need to institutionalize learning objects and materials for distribution to students to assist them in

acquiring knowledge related to their program. This approach, apparently, positively benefitted both faculty members and students from different campus in the same program, as they will be using similar topic guides. Consequently, groups of faculty experts were directed to produce institutional digital learning materials, also referred to as Study Guides. The study guides contain learning contents and activities for each pre-determined topic in individual syllabi and are delivered correspondingly to students. These study guides are stored and shared using various means because there is no institutional repository that will contain them.

Additionally, the study guides are used as instructional materials in all courses. Along with the syllabi and course guide, study guides are distributed to all class sections during each semester. These are shared through their teams in the LMS, through messaging applications, email, and other online applications where students can view and download them. The same are done with sharing other digital learning materials. Copies of digital learning materials are also requested and sent via messaging applications. Students use their mobile phones or computer storage to save these learning materials.

The institution's explicit and tacit knowledge are crucial in its teaching and learning process that needs proper organization to exploit and benefit from them. While various tools provide knowledge in different forms to students, and allow study guides to be shared, re-used, annotated, and modified according to the need for curricular delivery, the management of scattered learning materials and users needs to be well-planned to ensure that knowledge is collected, organized, distributed, and used effectively by faculty members and students. The absence of a centralized repository that houses digital learning materials as sources of valuable knowledge and established knowledge management procedures in the institution results in scattered and unorganized knowledge storage which yields to causing faculty and students to struggle to systematize the creation, consolidation, and sharing of online learning resources. Therefore, knowledge management is considered necessary to create, consolidate, transfer, and apply knowledge with the purpose of better achieving objectives.

Knowledge Management (KM) involves the acquisition, retention, storage, distribution, and use of knowledge in the organization and therefore addresses the full range of processes by which an organization deploys knowledge [8].

KM helps educational institutions to improve their capacity to gather and share information and knowledge and apply these to problem-solving and support the research and continual improvement of their work. KM of the educational system must reflect and comprise information at all levels starting from management level to student level to improve professional knowledge of employees, and to achieve quality of lecturers and students [9].

KM is the process of identifying, capturing, leveraging, sharing, and effective utilization of an organization's intellectual assets to enhance its performance and competitiveness. Knowledge management is the generation, representation, storage, transfer, transformation, application, embedding, and protection of organizational knowledge [10]. The main objective of KMS is to support the creation, storage, acquisition, and transfer of knowledge in organizations.

The concept of knowledge management system is known to be an important technology that improves management of institutional knowledge. It has been recognized internationally as an essential strategic tool in organizations, including academic institutions or universities. However, its integration into academic institutions falls behind compared to the industry and commercial sectors [11]. Universities are knowledge-based organizations actively involved in

knowledge creation and circulation. Knowledge sharing in a university entail exchanging knowledge among faculty and students, typically during class discussions, consultations, or forums. Literatures present that there are limited attempts by academic institutions to implement knowledge management and knowledge sharing systems [12],[13].

Therefore, to fill this gap, there is a need to develop a Knowledge Management System to cater the creation, storage and sharing of knowledge that could help in the growth of learner-centered knowledge in a higher education institution. Hence, this paper proposes a design of a Knowledge Management System for PSU that provides knowledge services features to facilitate centralized management of knowledge in the university relating to the teaching and learning resources, hence promoting, and strengthening the knowledge creation and sharing culture.

II. Methodology

The concept of knowledge management for higher education as an emerging technology is not new, and numerous significant undertakings and contributions have been accomplished and made by researchers in this field.

A systematic literature review identifies, evaluates and interprets available research relevant to a topic area. It is conducted to provide a background to appropriately position new research activities [14].

Using a systematic review of literature and related works conducted by different researchers provided valuable insights on the role and significance of knowledge management in academic institutions which provided bases for building a practical and efficient framework for a learner-centered knowledge management system that encapsulates well-organized and accessible institutional knowledge for effective knowledge management.

Semi-structured interviews were conducted with ten IT experts who are faculty members from the Information Technology and Computer Science departments in PSU to assess and review the proposed architecture and framework as to its applicability and viability.

III. results and discussion

After the conduct of in-depth review of the existing related literature and works, the authors have established a comprehensive system framework that comprises the appropriate knowledge services to support the implementation of the knowledge management phases.

A. *Proposed Knowledge Management System Framework*

The institution's explicit knowledge characterized in study guides constructed by teachers and other digital learning materials and tacit knowledge characterized in teacher's and student's experiences and interactions of using the study guides and other learning materials are the emphasis of the initiative to create and implement a KM system. Considering how the transfer of knowledge is affected by the current methods and tools used helped identify the challenges encountered by teachers and students, thus providing bases for the design of the framework of the knowledge management system.

Knowledge is created through collaboration, interaction and education [15]. In educational institutions, teachers are the main source of knowledge. Students attend to their classes to acquire knowledge from their teachers who discuss topics, share experiences, provide learning materials, etc. Higher education institutions create, share, and apply knowledge during the teaching and learning processes and activities. Learner-centered knowledge are created by faculty members and shared among students.

A proposed usage scenario shown in Figure 2 that involves the four major users was constructed to illustrate their roles and how knowledge creation, storage and sharing are conducted using the proposed KM system. Activities performed by each user are identified and assigned to eliminate conflict in their roles.

Knowledge sharing is likewise crucial in the teaching and learning process [16]. Teachers create explicit and tacit knowledge either individually or collaboratively for students' consumption. The knowledge produced must be reviewed, validated, and guaranteed useful to ensure that quality information is delivered to students.

Collaboration helps faculty members learn from each other through exchange of experiences, insights, technical skills, and other tacit knowledge. Faculty experts from the same field of specialization can share his/her expertise to colleagues to build collective knowledge and perform better. Through exchange of tacit knowledge, learning materials produced by teachers are guaranteed to contain relevant and useful information. Likewise, college and department heads ensure quality knowledge is produced before being published and stored by conducting review, validation, and monitoring of the inflowing information to the knowledge management system repository. Their assessment as to whether knowledge is useful to students is partially based on the ratings provided by students for the study guides that they use. This contributes to the continuous improvement of the institutional learning materials produced in the institution.

Knowledge must be readily accessible and retrievable for students' consumption [17]. A central repository would facilitate the storage of explicit knowledge to ensure reusability of knowledge. Study guides and other learning materials are organized, stored, and made accessible to students to help them learn the necessary knowledge and skills they need for their field of choice.
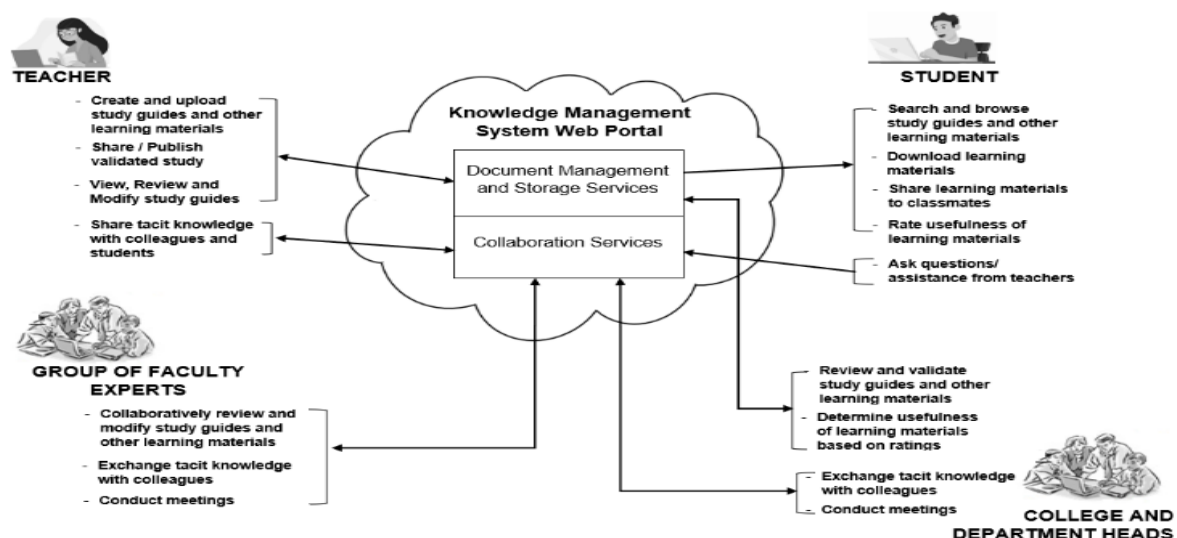

Figure 2. *Proposed Usage Scenario*

By examining the related works conducted by notable researchers, the authors gained a clear foundation of the appropriate components of a knowledge management system that will facilitate the creation, storing and sharing of learner-centered knowledge in the institution.

The proposed KMS framework, as shown in Figure 3, focuses on the connection among the components that come together to successfully implement a centralized knowledge management system that assists in achieving the institution's and individual programs' learning objectives. As mentioned, the institution does not have a proper mechanism to allow knowledge storage and sharing. Based on the general structure of a KMS, the framework consists of four components: the access channel, knowledge management services, knowledge warehouse, and infrastructure.
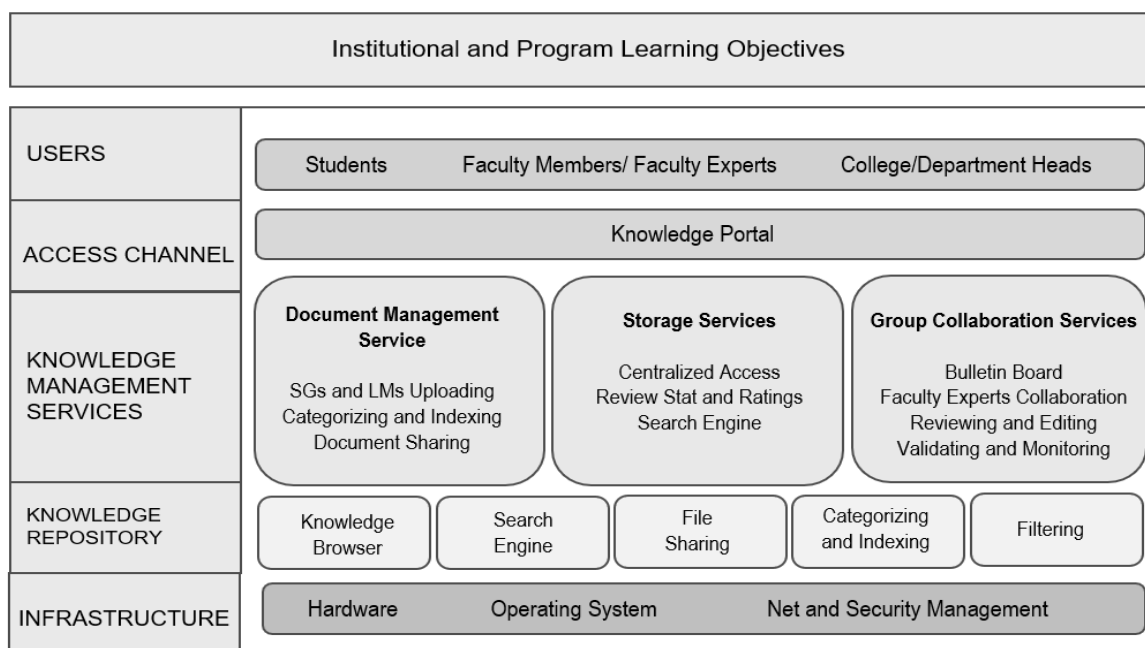

Figure 3. *Proposed KM Architectural Framework*

The proposed KMS framework provides a client access channel accessed through a web portal on the user's device. Knowledge portals support knowledge work to the users during their navigation and access to information [18]. Through a knowledge portal accessed via Internet through the user's device, document management services allow teachers and students to gain access to explicit knowledge (depicted in the study guides).

The Knowledge Management component includes document management, storage, and group collaboration services. The document management services allow users to upload and publish learning materials in the repository. Uploaded individual learning materials are categorized and indexed for structured storage and facilitates easier document sharing. The storage services offer centralized access to explicit knowledge, review statistics and rating data supplied by users, and search engine mechanisms for easy obtaining of knowledge. The group collaboration services allow users, especially faculty members or faculty experts and heads to collaborate with their colleagues and fellow experts to share experiences, technical skills, and other forms of tacit knowledge through web conferencing or discussion forum. It also enables faculty experts to collaboratively review and edit learning materials before validation and publication. Bulletin board informs users regarding updates and announcements.

The Knowledge Repository component stores and organizes knowledge and make it

available to users if needed through knowledge browser, search engine, file sharing, categorizing, indexing, and filtering.

KMS is a concept that can be used for creating knowledge repositories, improving knowledge access, and sharing as well as communicating through collaboration, enhancing the knowledge environment and managing knowledge as an asset for an institution or organization [19]. Knowledge warehouse enhances the retrieval and sharing of knowledge across organization [20]. A knowledge repository serves as SGs and LMs' central repository and includes knowledge services for storing, accessing, and organizing these materials.

KM and knowledge sharing tools such as search engines, Internet, intranet and peer to peer knowledge tools, all help learners to learn from anywhere and anytime and within the learning environment [21]. Similarly, a search engine provides students with open access to relevant study guides and learning materials anywhere and whenever needed. A filtering function in the knowledge warehouse allows the organization of knowledge. A rating mechanism to appraise the usefulness and relevance of the learning materials to their academic goals.

These services are materialized through the appropriate existing infrastructure of the institution including the hardware, software, and network security mechanisms.

The framework's design is motivated by the institution's aim of delivering education by establishing its institutional and individual program's learning objectives. In order to implement all the phases in the knowledge management theory, including knowledge creation, storage, organizing and sharing, the proposed KM architectural framework encapsulates appropriate services, shown in Table 1, aligned to assist users in their knowledge management endeavor.

Table 1. *Knowledge services aligned with knowledge management activities*

0	Knowledge Services in the Proposed Framework	Details
Knowledge Creation and Storage	SGs and LMs Uploading Reviewing and Edi Validating and Monitoring Search Engine Centralized Access	Study guides and other learning materials (video, presentations, e-books, files, etc.)
Knowledge Acquisition	Search Engine Centralized Access Review Stats and Ratings	Keyword searching Filtering
Knowledge Organization	Document Categorizing Indexing Filtering	Tree-structured folders Document tags/labels Document type
Knowledge transfer and sharing	Bulletin Board Faculty Experts collaboration Document Reviewing, Editing, Validating and Monitoring	Web conferencing Discussion Forum Group document reviewing and editing

B. Proposed Features of the Knowledge Management System

The proposed KM system for PSU has a client-server structure. The client side contains the user interface to display and collect information from the user. The server side that contains the application server and database system that processes user request and stores data respectively. Figure 4 shows the system architecture of the proposed KM system.
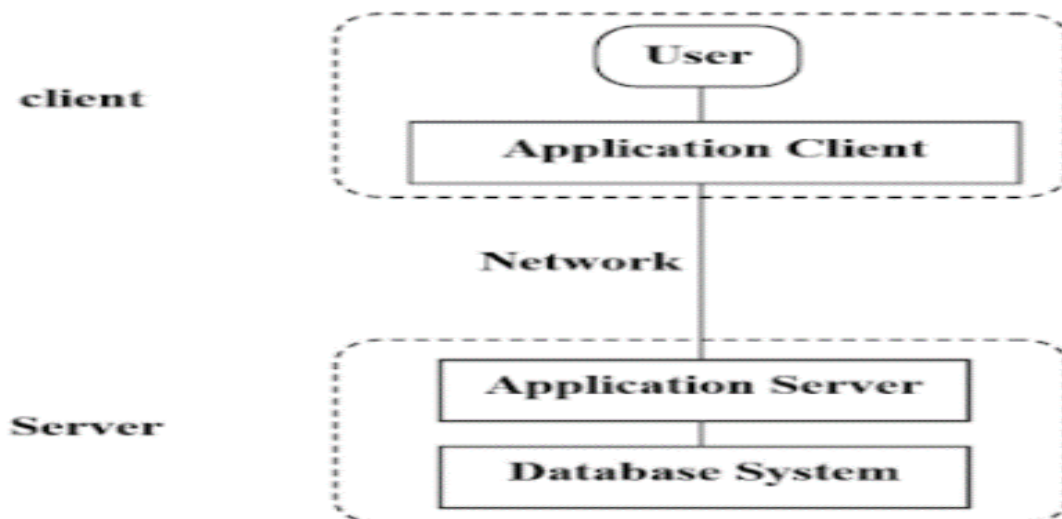
Figure 4. *KMS Architecture*

The following features are the identified appropriate features of the proposed KMS:

Knowledge Portal: A web-based knowledge management system supports collaborative learning that advances the quality of education [22]. This feature allows users to gain access to learning resources stored in the knowledge repository and allows students to communicate with their teachers whenever necessary.

Document Management – This feature allows faculty members upload study guides or other learning materials to be stored in the knowledge repository. Document indexing mechanism is applied to label individual documents which would make searching learning materials easier.

Faculty Experts Collaboration: New knowledge is created in interaction between people, when the communication is performed between individuals, who have different knowledge [23]. This feature includes web conferencing and discussion Forum to allow faculty experts from different campuses to conduct meetings to share or exchange tacit knowledge. Through this feature, institutional study guides and other learning materials used in the institution could be reviewed and validated by faculty experts before publishing and sharing to students. Sharing of expertise, technical skills, and other tacit knowledge can be done through this feature.

User Registration: this feature allows the system administrator to register students who are currently enrolled and have institutional email addresses in the institution. This feature ensures that only students enrolled during the semester are authorized to gain access to the institutional learning materials in the web portal.

C. *Viability of the proposed framework*

The semi-structured interview of faculty members from the IT and CS department of PSU confirmed that the proposed framework could improve the processes of organizing and sharing of institutional knowledge among teachers and students in the institution.

It was mentioned by the interviewees that with the presence of a centralized knowledge repository of learning resources, both the students and faculty members would only need to go to one access channel where they could search and retrieve knowledge they need. They said

that this will solve the problem of having scattered storages for learning materials. This will also lessen the struggle of faculty and students in retrieving and sharing learning resources using various online applications.

The faculty expert collaboration was also commended as it would enable sharing of knowledge that would benefit all faculty members of the same field of specialization. This will also help improve the knowledge created to be shared among students.

Though the proposed framework has confirmed its efficiency and viability in the interviews conducted, it is important to note the limitations that could characterize the framework. Firstly, the proposed framework could not be generalized in every organizational context hence, it is tailored for the teaching and learning processes specific to Pangasinan State University. Secondly, there is a need for rationalizing to the interviewed IT experts in the institution the concept of the framework.

IV. Conclusion

Today, higher education institutions need to be efficient in providing solutions to problems and equipped with appropriate tools related to teaching and learning process especially with the current challenges that educational institutions face. For that, they need to nurture a thriving knowledge sharing culture for the betterment of their clientele, the students. Accordingly, the authors conclude that a learner-centered knowledge management system designed appropriately for an academic institution can prove to be a promising techno management tool to enhance performance in the vital areas of teaching and learning processes. The proposed framework encapsulates appropriate components to facilitate effective knowledge management and if implemented, will yield more benefits to improve the quality of knowledge sharing and use in the institution.

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