

Toward Knowledge Management Approach to Enhance the Mobile Learning Management Systems

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Abstract. In the wave of digital learning, Mobile learning (M-learning) captures more and more attention. Advanced developments in wireless technology and the availability of mobile devices provide the learners the freedom of mobility in using. In this context, the learning process had gained more flexibility, as well as challenges in order to adapt and manage the learning object to this new framework through the use of Mobile Learning Management Systems (M-LMS), a cross domain between LMSs and mobile device . Moreover, as part of the learning process, Knowledge Management (KM) is integrated in the practical teaching activities as one of the methods that enhance the abilities of learners by encouraging them to create, share, apply, and store knowledge. For that, it is necessary to find a way to successfully transform ordinary M-learning to knowledge-based learning. In this study we compare three main M-LMSs that integrated a KM approach in their system: MOODLE, Blackboard and mEKP. We focus our investigation on how these systems apply KM strategy in their system. We compared these tools based on Nonaka and Takeuchi Knowledge Conversion Process Model that represents one of the common KM models helping to extract knowledge from data collection. We found that Moodle has adopted a Mobile Knowledge Management Learning System (MKLMS) that helps capture tacit and explicit knowledge from users through the use of mobile devices; and based on this we propose guidelines that might be followed to enhance integration of KM approach in M-LMSs and ensure gaining valuable results of the integration.

Keywords: Knowledge management · M-Learning · Learning management system · Knowledge management process · Mobile learning management system · Mobile knowledge learning management system

1 Introduction

Over the last decade, coverage of mobile phones development in great speed added the dimension of mobility to learning. M-Learning is an emerging form of distance

learning that offers both trainers and learners the “opportunity to interact and gain access to educational material using a wireless handheld device, independent of time and space” [1], [2], [3], [4], [5].

M-Learning is the learning accomplished with the use of small, portable computing devices. These computing devices may include smart phones, PDAs and similar handheld devices. Therefore, M-learning intersects mobile computing with e learning; it combines individualized learning with anytime and anywhere teaching [6], [7]. M-learning reduces the complicated and repeated work of the teacher. It allows the teacher to transfer or broadcast readily available materials to the students. Some students may be slower in learning and understanding. Such students can store and revise their lessons any time, any number of times and learn on their own pace [8], [2], [3].

Mobile applications generally allow users to control or filter information flow and interaction through the handheld devices. Portability, interactive, easy to operate, and targeted users are some advantages of M-learning [9]. BenMoussa identified several other benefits for mobile connectivity: First, mobile devices offer personalized or individualized connectivity. Second, mobile connectivity improves collaboration via real-time or instant interactivity that may lead to better decision-making. And third, mobile connectivity enhances users’ orientation or direction. These benefits are proved to be equally useful in improving the learning environment [6], [10].

M-LMS is a cross domain between LMSs and mobile device. It is a platform that externalizes the traditional learning system into the mobile environment, manage the learning object and actors, and provides the facility of interaction among learners and instructors in the mobile environment. Some of the existing LMSs have designed “plug-ins” or “extensions” as MLMSs such as MLE-Moodle that has been designed for Moodle [11].

The 21st century technology oriented economy concentrates on creating, managing and sharing information. This indicates that competition will be driven by knowledge revolution in the future. Integrating KM into practical teaching activities is one of the best methods for learners to enhance their abilities in KM and problem solving. KM has been defined as the process of selectively applying knowledge from previous experiences to current and future decision making activities with the explicit purpose of improving effectiveness. Moreover, KM is a strategy to be developed as a way to ensure that knowledge reaches the right learner at the right time. Knowledge can be classified as tacit or explicit [12], [13].

Tacit knowledge is subconsciously understood and applied. It is ineffable and based on personal experience and directly related to personal cognitive skills but may be developed from direct experience and action. Tacit knowledge is usually shared through highly interactive conversation, storytelling, and shared experience [14], [12], [13]. Explicit knowledge can be consciously understood and can be expressed in words, diagrams, or formulas, which can be easily codified, represented, documented, transferred and shared asynchronously [13], [12]. It may have different types; printed minutes of meeting, tutorial sessions on discs and tapes, documentaries, the official correspondence using faxes and e-mails, etc. [15], [16].

Knowledge has become the most critical input factors and the core asset. Therefore, organizations must manage knowledge and adopt a variety of effective means in

order to maximize and discover the potential of this resource and assets [17]. KM technology can be used to rapidly capture, organize and deliver large amounts of knowledge to its users. It connects people with the knowledge that they need to take action, when they need it [13].

From m-learning approach, it is extremely beneficial to learners' growth that KM is highly connected with the use of M-learning systems. It's necessary in order to capture the knowledge spread through the devices, enhance learning effectiveness and to share the knowledge with others. It is also important to provide teachers, educational policy-makers, and researchers with a better representation of educational affordances of M-learning. Due to the previous reasons and because KM is regarded as an important part of developing M-learning and, finding a way to successfully transform ordinary M-learning to knowledge-based learning will be necessary in order to enhance learning effectiveness and to share the knowledge with others [6]. The need for a more applicable framework is emerging nowadays to provide teachers, educational policy-makers, and researchers with a better representation of educational affordances of M-learning [6].

This paper focuses on how KM has been introduced in different kinds of M- LMS. First, KM process in the M-Learning sector will be produced after defining Nonaka and Takeuchi model. Second, a comparative study will be proposed. It concentrates on comparing between different M-LMSs according to how these systems apply KM strategy in their system and to what extent it is effectively used. Later, MKLMS that Moodle adopted will be presented. Finally, we will propose some guidelines be followed to enhance integration of KM approach in M-LMSs and ensure gaining valuable results of the integration.

2 M-Learning KM Process

2.1 KM Model

For the conversion of Tacit to Explicit and Explicit to Tacit knowledge Nonaka and Takeuchi (1995) Knowledge Conversion Process Model has taken great interest of researchers for the creation of new and innovative knowledge. The knowledge conversion process follows specific pattern (figure 1).

Socialization: this is considered as Tacit-Tacit knowledge conversion, the individuals share their experiences and knowledge in a form of team in an organization or network.

Externalization: also referred as Tacit- Explicit knowledge. The externalization is storing the tacit knowledge, which is strongly the context-based fact into explicit knowledge with context-free knowledge condition in knowledge repository.

Internalization: this is also considered as Explicit- Tacit knowledge. The knowledge in the explicit form is taken out from the repository, which is required by the person according to his need and relevance.

Combination: also considered as Explicit-Explicit knowledge. The categorization, sorting, addition and deletion of explicit knowledge in repository are performed in this stage [15], [18].

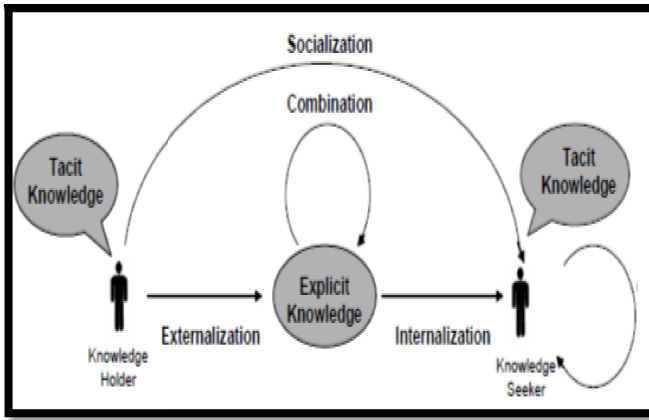


Fig. 1. (Nonaka and Takeuchi Model [15])

2.2 Knowledge Management Process in M-Learning

KM process is converted into practical teaching methods. Without being limited by a classroom, learners can browse materials and share the experience with others. They can also personalize knowledge organization and save it through the wireless network. Learners can carry out self-learning which enhances problem solving skills [19]. The need for a more applicable framework is emerging nowadays, a MKLMS framework that inspires learners to acquire, store, share, apply and create knowledge [19]. A KM process in m-learning proposed by Liaw et al is presented and used in this study to compare KM processes used in different M-LMSs.

Liaw et al. proposed a five-stage approach to lead learners to master new knowledge: knowledge retrieval, knowledge gathering, knowledge analysis, knowledge construction, and knowledge management [6].

Knowledge retrieval stage helps individuals to ensure that attention is concentrated on relevant knowledge that can then be retrieved. Knowledge gathering is the stage in which relevant knowledge can be found. Both knowledge retrieval and knowledge gathering can be performed by users using a mobile device (PDA). It means users can search, retrieve, and collect Internet resources via handheld tools. Knowledge analysis stage is based on individual experience and helps an individual to understand what the demanded knowledge is [20]. The stage of knowledge construction is attained through learning and previous task performances. Finally, knowledge management stage in which individuals manage knowledge and share knowledge with others [9]. After the first two steps, users process knowledge analysis, knowledge construction, and knowledge management by using laptop computers. Figure 2 shows the architecture of the knowledge management process m-learning system [6].

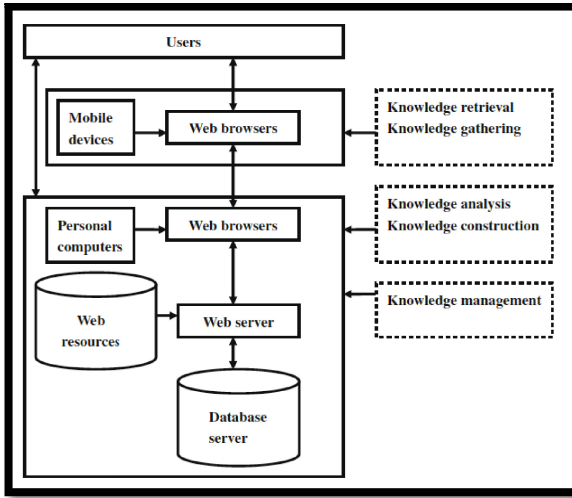


Fig. 2. (Architecture of knowledge management process in M-LMS [9])

3 Comparative Study

Just when the M-learning revolution came along and LMS companies reached a limit of saturation, LMS companies started to present new M-LMSs to market their products. Some have done cosmetic changes, redesigning their interface to fit on a small screen. A few have designed M-LMSs that actually work on smart phones and tablets. Some have even developed stand-alone LMSs that do not need to be connected to a non M-LMS [11].

A few of the LMSs have been designed with mobile computing in mind. For example, the Moodle interface consists of a three-column layout that is very mobile friendly [11]. M-LMS (Moodle) has been integrated with a KM system to enhance the effectiveness of learning outcomes. Learners and instructor can interact and discuss specific topic with the relevant material available in the system. Knowledge analysis and construction is being applied through giving the user the authority to modify and extend the knowledge according to his needs, considering that access is given to registered users only [21]. Discussion forums are used to share knowledge between users which ensures consideration of knowledge management [15]. Moodle's course management system has the facilities of knowledge retrieval and gathering.

Another approach is to design "plug-ins" or "extensions" for existing LMSs. Blackboard has an extension for their Learn 9.1 platform called Blackboard Mobile that lets users receive notification of updates to their Blackboard courses, including new assignments, course content, study group updates, community discussions, and their grades/assessment results [11]. Blackboard applies knowledge gathering and retrieving through allowing the automatic coupling of existing student databases with Blackboard, making course visible to the worldwide Blackboard community. Courses published by instructors from other institutions can be searched from the course

cartridge library and accessed after getting the permission from the course owner [22]. It also includes an asynchronous discussion board as a tool through which learners might socially interact in one-way or another assuring the use of knowledge management. Blackboard can collect and archive the online discussions that take place in its discussion board and later copy it into a word-processing document for further knowledge analysis [23], [24].

There are signs of innovative new solutions that will transform the world of M-LMSs, and not simply reuse the concepts of desktop LMSs. One example is the mEKP (Mobile Enterprise Knowledge Platform) M-learning management system from Net Dimensions that delivers a full-featured LMS on a USB stick. This allows students to go off-line, do their work, and have it tracked without a connection to the Internet. They simply take their USB stick with them and plug it into an Internet-connected computer at the first opportunity [11]. It is multi-user (20, 30 or more users can use it concurrently or separately) – making it a powerful option for remote locations [25]. All training documents are distributed through mEKP system making the latest version available for knowledge gathering. Students can participate in virtual classroom training or take courses online. Knowledge construction is applied through allowing all content creators and experts to contribute content, store content centrally and deliver content so that it is readable on a variety of devices. It supports different collaboration tools some take the form of questions and answers between members or feedback and suggestions about the products or courses, their acceptance in the field and ideas for the future which assures covering knowledge management. Reports are generated and provided on demand giving feedback on the state of various learning activities [26].

According to the previous analysis of current situation of the M-LMSs depending on their appliance of KM process that has been introduced by Liaw et al, we were able to propose comparison between the different M-LMSs presented in table 1. The comparison shows what stages in Liaw et al KM process has been applied in each M-LMS.

Table 1. (Knowledge Management Process in different M- LMSs)

KMP in M learning M- LMSs	knowledge retrieval	knowledge gathering	knowledge analysis	knowledge construction	knowledge management
MOODL E	✓	✓	✓	✓	✓
Blackboard	✓	✓	✓		✓
mEKP		✓		✓	✓

4 Guidelines for MKLMS

4.1 Moodle KM Model

Most of the discussed LMSs consider the need for KM to enhance educational process, although lacking some of the important KM processes such knowledge construction in the blackboard system. Both blackboard and mEKP didn't rely on a certain KM process to ensure the coverage of all steps of KM.

On the other hand, MOODLE integrated a KM process to insure efficient capturing of knowledge and its delivery for quality learning. It has adopted Nonaka and Takeuchi model for transferring knowledge. Nonaka focuses on the vitality of knowledge formation by considering the implicit and explicit elements of knowledge creation[15]. Figure 3 shows the integration of KM and E Learning that Moodle adopted [15].

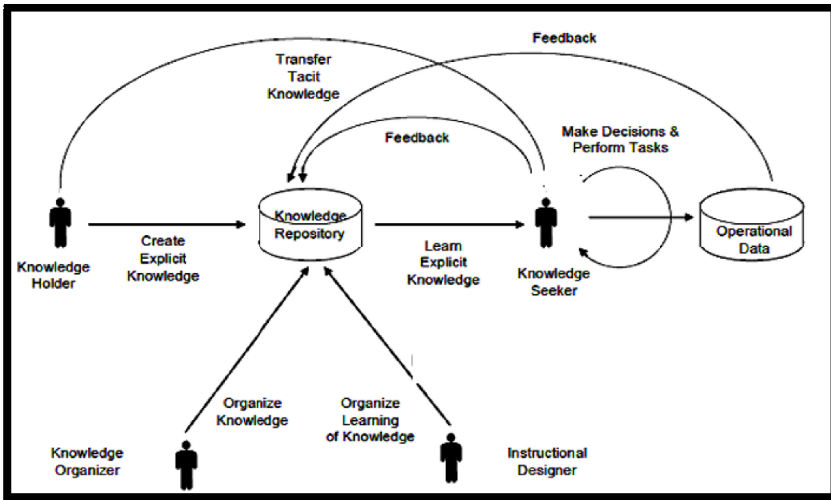


Fig. 3. (Integration of KM and E Learning adopted my MOODLE (MKLMS) [15])

- The instructor (knowledge holder) can store his experience and knowledge (Tacit knowledge) in both the knowledge repository through externalization and can also transfer that to the learner (Knowledge seeker) via socialization.
- The knowledge organizer will help in the placement of relevant information in it proper place for the purpose of refining and indexing the knowledge.
- The instructional designer works on the new learning aids creation, assignment posting and creating new modules.
- The learner is able to receive more knowledge from the knowledge repository through internalization and also from the instructor through socialization. The working and performance of the learner is operationalize and then again returned to the knowledge repository as a feedback. In discussion forums of MOODLE students and instructor perform socialization and then internalization and externalization for

creating the explicit knowledge; however the CMS perform the task of combination for the new and quality knowledge creation [15].

4.2 Guidelines

After investigating the current situation of the three M- LMSs and to what extent did they cover KM processes, and based on Moodle's implementation of MKLMS, we came to some guidelines that would help other M- LMSs to integrate KM processes in its' systems:

1. Adopt a knowledge management process and integrating it into the M- LMSs to ensure capturing, transforming, storing and sharing different types of knowledge through the use of M-learning.
2. Use of KM process or model that is suitable for education to ensure that both tacit and explicit knowledge is being considered for the benefit of instructors and learners.
3. Focus on capturing tacit knowledge of instructors and learners and add functions to make it clear and easy.
4. Analyze documents stored and categorize them to help reach them much faster and easier.

5 Conclusion and Future Work

This paper shows the importance of applying KM approach in M- LMSs. It presents how this will increase the effectiveness of learning and sharing knowledge. The integration of KM in the M- LMSs will be useful for the efficient capturing of knowledge and its delivery for quality learning. It also sheds light on current M- LMSs' achievements toward KM in the M-learning environment and ways to improve it through proposing some guidelines and hints.

As future work, we plan to further apply the MKMLS for other M-LMSs and test its' usefulness and effectiveness in the M-Learning sector. Adding some functions to optimize KM and learning activities for current M-LMSs will also enhance benefits of M-Learning.

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