Improving Knowledge Management in e-Learning: A Contingent Framework for Efficient Knowledge Transfer

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Abstract - Knowledge management (KM) is the top most important factor in e-Learning. This research paper explores the role of KM in e-Learning and develops a conceptual framework for successfully managing and transferring knowledge. We review different types of knowledge and discuss how varied KM techniques, e-Learning technologies, platforms and possible solutions improve KM and knowledge transfer in e-Learning programs. Our research framework is grounded theoretically in the knowledge creation theory and the media richness theory. This framework is extremely useful to the academicians and practitioners alike as it guides them in implementing a respectable pedagogy for effectively managing and transferring knowledge in the e-Learning environment.

Keywords: Knowledge Management, Knowledge Transfer, Course Combination, Research Framework, Knowledge Management Systems

1 Introduction

E-Learning has become a well-known popular alternative to traditional education. Today, many colleges and universities around the world adopt it. Several universities are starting to teach online versions of their courses and new logical universities are coming to exist to include this demographic of the population. A number of trends such as developments in information and communication technologies, flexibility and convenience of distance education have accelerated the demand for e-Learning. Asynchronous online education allows individuals to achieve the ability to harness the power of the Internet or a local Intranet to obtain educational materials and services at any place or time with accessibility.

However, e-Learning poses some unique challenges as learning in this environment is distributed with students and instructors physically separated in space and time. In addition, the students exercise volitional control of learning rather than the instructor. The success or failure of learning in e-Learning courses depends not only on the course design and quality of the content, but also on how fruitful the knowledge transfer has been from the instructor to the students as well as from students to students. Therefore, knowledge management (KM) is the uppermost factor in any e-Learning environment.

This research paper explores the role of knowledge management in e-Learning and develops a conceptual framework for managing knowledge effectively in e-Learning programs. We discuss different types of knowledge and make an analysis of how varied KM techniques, e-Learning technologies, platforms and online solutions are usable in managing and disseminating the knowledge. Our research framework is grounded theoretically in the knowledge creation theory [1] and the media richness theory [2]. Our framework is extremely useful to the academicians and practitioners alike as it provides them the expertise to implement a respectable pedagogy to maximize the online students’ learning curves with proper KM management. We will validate this framework through an assessment by a panel of experts as well as a lab experiment in a future study.

The rest of this research paper is organized as follows. The next section discusses the unique facets of learning in the environment of e-Learning. It will be followed by a review of KM literature on what constitutes knowledge, different types of knowledge and how knowledge is created. Following it, we describe the research framework for managing and transferring knowledge effectively. Finally, we conclude the paper with discussion on contributions to research and implications to practice.

2 The e-Learning environment

An important aspect of KM is the transferring and sharing of knowledge as opposed to dissemination of information. For the knowledge to be successfully transferred and shared there has to be a close interaction between the student, instructor, learning content and peers in the class. The e-Learning environment differs from traditional learning environment in many ways. First, the e-Learning environment allows both synchronous and asynchronous learning unlike traditional environment where synchronous learning is the most common form. The learning in the e-Learning context is generally self-paced, with zero to many virtual interactions using tools such as virtual lecture halls, Skype, chats, discussions and so forth. Second, students tend to be afraid to ask questions in traditional settings, which lowers participation, while students in online learning ask them easily [3]. Third, equal contributions from each learner can occur in the environment of e-Learning, while
traditional methods must move on to the next lesson to accommodate their time periods which will leave out crucial contributions from students. Fourth, online education allows more time for the individuals to mediate about the situation and assert an effective meaningful response. Fifth, e-Learning environment requires the students to have access to technology and be competent in using the required technology to access the course content. Traditional methods will not need technology access and can press on without these types of amenities. The lack of this feature will create a technology access barrier against the student in the knowledge transfer of an e-Learning environment [4]. Several other differences exist between these two learning environments, but the above discussion facilitates crucial facets of e-Learning.

3 Knowledge

Knowledge is the accumulation and awareness of information, facts, ideas and principles. It can be acquired by study, investigation, observation and experience. Knowledge management is critical in harnessing these varieties of knowledge [6, 7]. Knowledge is the main capital of knowledge workers and exists in a variety of forms and media [5]. Knowledge can be explicit or tacit [1, 7]. The combination of explicit and tacit knowledge makes up the learning content in e-Learning. Knowledge management is critical in harnessing these types of knowledge [6, 7].

3.1 Explicit knowledge

Explicit knowledge is knowledge that is consciously understood and can be formally articulated, codified and documented [1]. Explicit knowledge exists in forms of words, documents, computer programs or other means [8]. Content management systems such as Blackboard and WebCT support the creation, storage and distribution of explicit knowledge. The course administrator can upload the explicit knowledge content into the knowledge repository for the students to retrieve and review at any time during the lesson. Non-existence of this content material will lead the individuals to failure. In the environment of e-Learning, this is a crucial aspect since face-to-face meetings do not exist.

3.2 Tacit knowledge

Unlike explicit knowledge, tacit knowledge is subconsciously understood and applied. It is very difficult and challenging to articulate, share and leverage this type of knowledge. Generally speaking, tacit knowledge includes personal experiences, judgment, skills, individual expertise and integrates human factors such as beliefs, perspectives and culture that make it very difficult to interpret [4]. Because of “tacit-ness” in knowledge, it is not feasible to capture it in a report or a power point slide. In the e-Learning environment, articulation and sharing of tacit knowledge requires highly interactive conversations, shared experiences and the use of appropriate knowledge transfer techniques, such as storytelling, mentoring, content maps, tools and technologies that have the capability to support rich media.

The online environment can have sufficient explicit materials, but the lack of tacit knowledge will lead to confusion of the subject matter and the inability to complete the lesson. An example is in programming, the student might learn the syntax of the language that resembles the explicit knowledge but not the actual logic behind the coding, which is the tacit knowledge. Tacit knowledge is vital to increasing the learning and knowledge transfer [4]. Several instructors exhibits different levels of tacit knowledge due to their field experience and overall wisdom and it is important that this knowledge be shared with the students.

4 Knowledge transfer

Depending on the knowledge type, four different processes are involved in knowledge conversion and transfer [1]. These are socialization, externalization, combination and internalization [1]. Table 1 presents Nonaka and Takeuchi’s KM model [1].

<table>
<thead>
<tr>
<th>From</th>
<th>Tacit</th>
<th>Explicit</th>
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<td>Socialization</td>
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• Socialization involves transferring tacit knowledge from one person to another person through socializing and exchanging of ideas and experiences.

• Externalization involves articulating and translating tacit knowledge into explicit knowledge and storing it in a repository.

• Internalization involves acquiring explicit knowledge from repositories, books, Internet and other public sources and internalizing it, where upon it becomes tacit knowledge.

• Combination involves combining explicit knowledge from multiple sources to create new explicit knowledge.

4.1 Knowledge transfer in e-Learning

The current students’ obtainment of knowledge requires a successful learning strategy from the instructor and an adequate feedback mechanism to determine the potency of the overall transfer of knowledge in each lesson. The feedback mechanism will serve to instill changes in the
learning strategy and to fill in the voids that the students exhibit during the testing stage to achieve top optimization of overall knowledge transfer of the course material. Figure 1 presents the flow of knowledge during an e-Learning course, which facilitates the different stages and impediments to the knowledge transfer during the course’s progress.

![Knowledge Transfer Diagram](image)

Figure 1: Knowledge transfer in an e-Learning environment

Communication technologies such as email, forums, chats and video conferencing support knowledge transfer [4]. Effective transfer of knowledge requires several prevention techniques to reduce barriers that will affect the learning of the online student(s) [4]. These barriers will include cultural differences, low computer literacy, lack of technology access, lack of trust and several impediments that affect the learning [4]. Online environments will have different types of barriers from traditional methods and will need proper adjustment to provide an excellent learning strategy.

## 5 KM in e-Learning

The management of knowledge is one of the key characteristics in achieving successful knowledge transfer in e-Learning [3]. The lack of efficient knowledge management will spark confusion among students, create impending barriers and lower the overall knowledge transfer of the lesson(s). These types of barriers need proper elimination or secession with a well-planned deterrence strategy to lessen the barriers’ presence to achieve top optimization for the success of knowledge transfer in an e-Learning environment.

### 5.1 KM in traditional education

Traditional course delivery requires students to attend synchronous meetings in a physical classroom setting with the instructor presenting the lecture over the lesson’s subject matter [10, 11]. There is not an online knowledge repository to provide explicit materials to the students in true traditional delivery. The students will need to take notes and uphold mental images of the lecture if the professor does not hand out hard copy material over the lecture. Explicit knowledge will come in the form of the course manual and the handouts. Other documentation from the instructor might be available depending on the learning strategy employed and the degree of active teaching involved. Much of the tacit knowledge that exists in the minds of individuals is transmitted through social group interaction and networks making knowledge management people-intensive [8]. Internship and mentoring exercises provide practical experiences to students. Upon externalization, the people-intensive knowledge becomes technology-intensive. The feedback mechanisms to determine the students’ learning curves are crucial to achieve top optimization of the course’s knowledge transfer. Hybrid courses have been emerging to instill an online knowledge repository. This hybrid development combines traditional and online functionalities [10]. Hybrid implementations need to analyze the material, determine the translation of this material to an online format and evaluate and change the strategy as issues emerge [10]. This functionality allows traditional settings to achieve several opportunities and lowers the course burden that might be present in traditional delivery.

### 5.2 Challenges of KM in e-Learning

The management of knowledge in e-Learning is a new ballgame in comparison to the traditional delivery. Students can set the learning at their own pace in most e-Learning instances [10]. The implementation of e-Learning is not hybrid and has several differences from traditional knowledge management. Explicit materials will be present in the online repository for downloading and studying. The lack of these materials and the absence of a procedure for advancing will present a barrier. There are no physical class meetings in e-Learning and the entire course is run in virtual reality [10].

Tacit knowledge becomes much harder to acquire from this standpoint due to the lack of observation and other tacit knowledge acquisition means that exist in the traditional setting. Therefore, it becomes critical to implement chats, discussions, wikis and video and audio conferences to raise the students’ learning curves. Testing will come in the form of online quizzes and exams, but some institutions may require proctoring in these situations to reduce academic dishonesty. The results will provide the feedback mechanism
to implement new materials in the knowledge repository that will help with the students’ weaknesses. Another barrier in online setting is cultural differences. Online learning can harness worldwide or regional cultures that differ widely and may cause issues such as the ones with language and linguistics [4]. A last barrier in e-Learning is the lack of trust that appears in the online environment [4]. Students do not meet the instructor(s) and therefore may not establish an emotional bond that facilitates knowledge transfer. This can create distrust and cause the student(s) to create a mental block since these individuals are not sure over the legitimacy of the material or about bias presentation from the individual.

6 Improving KM in e-Learning

Knowledge management (KM) has various paths to establish sufficient knowledge transfer in e-Learning. A successful learning strategy or pedagogy with high degree of knowledge management in the online repository will raise knowledge transfer and the overall students’ learning curves.

6.1 Media richness

A communication channel facilitates interaction and sharing of knowledge among individuals. Examples of few online communication channels include video conferencing, teleconferencing, chats and the use of social networking tools such as Web 2.0 technologies. Per media richness theory [2], each of these channels has its own advantages and disadvantages and as such is more suited to transfer particular type of knowledge over the other. The media richness is the ability of a medium to transfer information and has lean and rich implementations for each of the two types of knowledge [12]. Lean material will include electronic mails, documentation, asynchronous audio and discussions that are common in either learning methods. Video conferencing, face-to-face communication, and several other interactive tools facilitate rich media into an e-Learning environment. Any medium typically has two types of capacities to carry information. These are the data carrying capacity and the symbol carrying capacity [12]. The data carrying capacity is the ability to transmit overall information such as the throughput [12]. The symbol carrying capacity refers to the ability to carry metadata over the situation [12].

Media richness theory defines the richness of a medium as its capability to reduce uncertainty and equivocality in the information presented. It asserts that matching the richness of medium to the task improves the performance of the task. Further, it claims that richer media is better at supporting tasks that have both uncertainty and equivocality built into them. Rich media such as face to face interaction, video conferencing facilitates users to communicate effectively by allowing them to convey multiple cues (body language, facial expressions, voice tone etc.), immediate feedback, personalization and language variety, thus, improving the performance of the tasks. Alternatively, lean media is better suited to less equivocal tasks. The choice of media used to present contents in an e-Learning program influences how effectively knowledge is transferred and shared among the learners in the e-Learning course. For instance, lean media may be sufficient to transfer explicit knowledge. However, rich media is necessary to facilitate the effective transfer of tacit knowledge that requires high interactive conversations, shared experiences and use of knowledge transfer techniques.

6.2 Research Framework for improving KM in e-Learning

Our research framework is grounded theoretically in the knowledge creation theory [1] and the media richness theory [2]. Based on theoretical conceptualizations of these theories, we have assessed the various communication media, KM techniques, tools and technologies for their potential to allow transferring and sharing of knowledge in the e-Learning program. Table 2 maps the Nonaka and Takeuchi’s KM model with the appropriate communication media, KM techniques, tools and technologies for effective capture and transfer of knowledge in e-Learning. The classification is tentative and is presented as theoretical propositions.

| Table 2: Mapping Communication Media to Knowledge Creation and Transfer Process |
|-----------------|-----------------|-----------------|
| **Nonaka and Takeuchi’s KM model [1]** | Tacit | Explicit |
| **TO** | **Socialization** | **Externalization** |
| Tacit | Knowledge Portals, Knowledge Maps, Online social networks, Video Conferencing, Web2.0 Technologies, Corporate Yellow Pages, Streaming, Audio/Video | Groupware, Knowledge Portals, Knowledge Based Systems, Workflow, Video Conferencing, Web2.0 technologies, Chat Rooms, Document Tagging |
| **FROM** | **Internalization** | **Combination** |
E-Learning technologies coupled with KM facilitate each of these different types of knowledge creation and conversion processes and allow a high level of knowledge transfer. Socialization requires the creation of a collaborative learning environment between the instructor and the students as well as among the students. Online social networks such as Facebook, Twitter, Web 2.0 technologies, knowledge portals and knowledge maps facilitate tacit to tacit knowledge transfer by identifying and promoting high interaction among students and instructors with special interests, shared experiences and knowledge. Online social networks often function as virtual lounges wherein instructor and students can converse with one-to-one, one-to-many, and many-to-many students and collaborate on their school work. Social networking sites such as KnowledgeBook, BookTag, and SlideShare are known to facilitate knowledge dissemination.

Externalization involves articulation and translation of tacit knowledge into explicit knowledge and storing it in a repository. The knowledge of instructors and other learners in the e-Learning course can be captured and represented using appropriate knowledge transfer mechanisms and can be made available for reuse by others. Some tools that externalize knowledge in e-Learning include content maps, knowledge portals, synchronous and asynchronous groupware, application sharing, instant messaging and learning management systems. Internalization involves acquiring explicit knowledge from repositories, books, the Internet and other public sources then internalizing it, where upon it becomes a tacit knowledge. Several e-Learning media such as Web 2.0 technologies, including wikis and blogs, foster an innovative learning environment. Finally, the combination technique creates new knowledge in the e-Learning course using knowledge portals, document management systems, document tagging and other means. Pedagogical techniques can also be included in this process.

6.3 Document tagging

E-Learning materials are exponentially rising in quantity causing difficulty to organize and disseminate materials with the abundant information [13]. Large collections of knowledge will become harder to sift through and can cause delays and confusion. Achieving the ability to index materials is crucial to the classification and the dissemination of knowledge in an online repository. Archiving knowledge will help with successful searching and rendering of information inside the knowledge repository and raise the efficiency of the overall knowledge transfer. Marking the documentation with descriptive tags becomes a common method of accomplishing efficient future searches [13]. Instilling this ability into the knowledge will allow efficient results during searching to the actual information that the user needed and eliminate false positives.

There is a great demand for knowledge and information causing information overload which is a serious issue [14]. Information overload is a critical barrier during a student’s knowledge transfer and reduction of the said will prove vital to successful knowledge transfer. Adobe Acrobat, FileFold and several other knowledge control programs allow metadata tagging with certain versions for portable document formats or other documents with simple processes. Another example is Meta tags in HTML documentation that will permit the parser to optimize search engine results and the browser’s behavior. A last method is document clustering, which help group documents and ensure effectiveness with the proper usage of algorithms to improve accuracy with similarity matrices and probabilistic methods [14]. Instilling these types of metadata functionalities in the material will improve overall knowledge management and benefit the courses’ knowledge transfer in the e-Learning environment.

6.4 Yellow/White Pages

An expert directory is another managerial technique that exists to allow a source of obtainment for human capital and their respective knowledge. Yellow Pages, or sometimes referred to as White Pages, are essentially a list of available experts, expertise and contact information [15]. Yellow Pages foster knowledge communication between co-workers through the meta-knowledge of experts, but do not maintain the actual knowledge [15]. Tacit knowledge becomes highly available with this system and will help improve productivity and flexibility in these organizations. In the event of the necessity of knowledge to incur competitive advantage, then the recipient(s) can review the Yellow Pages and deduce possible knowledge sources over the particular topic for their specific issue. Large pools of employees from different geographical locations disallow the ability to personally know each of these individuals [15].

Keeping the system up-to-date is critical for efficient knowledge management. Personal ownership abilities to update their own respective instance will help eliminate the principles of neglect and ignorance with ensured participation. Initiating this directory into an easy to access area and reminding the users of its existence is another key aspect. The benefits from Yellow Pages are manifold. The institution will be able to identify who knows what and share the knowledge to gain competitive advantage [15]. The dissemination of knowledge is crucial for sufficient knowledge transfer to e-Learning students. Lack of expert directories such as yellow/white pages in the institution will incur a learning barrier and prevent successful student learning curves or development of pedagogies for instructors.

6.5 Combining course instances

Many universities generally have multiple sections for some of the courses taught each semester. Often, the instructors teaching different sections have different levels of tacit and explicit knowledge depending on their field experiences and other factors. Also, the teaching methods they employ are different. While some are proactive and provide all the content materials needed to maximize the
student’s learning, others may provide minimal content. This creates an impediment that will cause unfairness between these course sections and will cause few of the students not to achieve their full potential. A simple remedy is to store all the important content materials in a centralized repository and give students and instructors to access it.

The mandated learning objectives from the university system will remain the same in each section, but will have different delivery methods. Each instructor will still have his or her own pedagogy of teaching, but knowledge will be obtainable in every instance from the combined course area for the students. Discussions would achieve more responses from students, which raises the knowledge level and reduces bias of the subject. Other advantages remain and will raise the overall learning curve from the abundant material. The diagram below depicts this scenario to raise the efficiency of knowledge management and improve knowledge transfer in an e-Learning environment.

![Diagram of Knowledge Combination Inside of a KMS](image)

**Figure 2: Knowledge Combination Inside of a KMS**

7 Learning mgmt. & content systems

Implementation of efficient learning management with the previous research framework and the other facets exhibits a correct strategy to apply a successful e-Learning experience in an instructor’s pedagogy. In traditional methods, knowledge creation and dissemination happens through lectures, face-to-face interactions, mentoring and practical hands-on experiences. E-Learning relies on learning management and content systems since both of these systems serve as repositories and medium of communication and collaboration during the entire course while synchronous actions are not present. The actual knowledge transfer is the most crucial aspect in learning and will require an efficient knowledge repository for the most successful dissemination capabilities.

Learning management systems can exist through intranets or extranets depending on the university’s preference and funding. There are several operable database mediums to allow universities to harness this KM functionality. Moodle, Blackboard, WebCT and internal databases are a few examples of learning management systems. Each has a wide variety of available tools to implement successful management and dissemination of the course content. Several of these systems also allow communication, collaboration, group decision support and technical help. A crucial aspect of these systems is the interface’s user friendly aspect and its functionality that it provides to the end user population. Management inside of these databases can be astounding, but the lack of navigability will cause user confusion causing a lower learning curve. Therefore, courses in the learning management system have to be carefully designed in order to optimize knowledge transfer.

8 Contributions & implications

This research article reviewed different types of knowledge and analyzed how usage of varied KM techniques, e-Learning technologies and platforms improve KM and knowledge transfer in e-Learning programs. We developed an extremely suitable framework for efficient knowledge management in e-Learning. The framework based on the knowledge creation theory and media richness theory utilizes a well-built pedagogy that minimizes barriers and raises the overall creation and transfer of knowledge. We will validate this framework through an assessment utilizing a panel of experts and a lab experiment in a future study.

Successful knowledge management in e-Learning begins with the implementation of explicit knowledge in the knowledge repositories, knowledge portals and learning management systems. However, it is important to note that managing and transferring tacit knowledge effectively is vital to increasing the overall learning of students. We assessed the various communication media, KM techniques, tools and technologies and contend that rich media is necessary for effectively managing and transferring tacit knowledge. Our framework and recommendations are extremely useful to the academicians and practitioners alike as they guide them in implementing a respectable pedagogy for effectively managing and transferring knowledge in any e-Learning program. Several other adjustments to help raise the adeptness of KM in e-Learning are also discussed. Instilling combination methods to reduce redundant materials will provide across the board information to all students. The use of document tagging and utilization of corporate yellow pages are other available methods to enhance learning.

9 References


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