The role of knowledge management and E-learning in professional development

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ABSTRACT

The rapidly growing use of technology in education is changing the way in which knowledge is produced, stored and distributed. Online education has already been accepted as the way of the future; knowledge may be distributed across both time and space. Knowledge Management (KM) techniques can be used to capture, organize and deliver this knowledge and management systems can be used to quickly identify the most relevant information and distribute it to meet specific needs. In this paper, light is shed on the basic concepts of KM and e-learning. A discussion on how KM and e-learning can be integrated and leveraged for effective online education and training is presented.

Keywords: knowledge management; knowledge management models; knowledge management processes; ICT-enhanced learning; e-learning systems.

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INTRODUCTION

In recent years the rapid and continuing evolution of technology has converted our world into a knowledge society. A knowledge society strategy will ensure that all business operators and the public sector have the skills needed in a rapidly developing information society. Companies will invest heavily in the innovation environment and in research and product development, anticipate and safeguard the supply of a trained workforce and ensure high-quality education. Moreover, companies will promote open and lifelong learning and on-the-job training by means of Information and Communications Technology (ICT).

Recent research reveals great interest in introducing Knowledge Management (KM) ideas to e-learning systems. It is argued that KM can facilitate an e-learning system (Denning, 2000). The joint studies of KM and e-learning point out the same fundamental goal: facilitating organizational learning. Researchers try to analyze the similarity of the goals, methods of assessment and some knowledge-sharing processes both in KM and e-learning. An e-learning

26

system within KM is traditionally analyzed as a knowledge resource repository, where the KM methods can be implemented to increase the effectiveness of knowledge dissemination (Sherwood, 2001).

In this paper, the main features of e-learning that benefit the KM approach are discussed. At the end, an integrated approach between KM and e-learning is introduced.

2- Knowledge management definition and models
2.1 Definition
The term 'knowledge management' is used to describe everything from the application of new technology to the harnessing of the intellectual capital of an organization. It is not one single discipline; rather, it is an integration of numerous endeavors and fields of study. Rowley (2000) describes KM as follows: "Knowledge management is concerned *the role of knowledge management and e-learning in professional development* with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives." The knowledge to be managed includes both explicit, documented knowledge and tacit, subjective knowledge. Management entails all of those processes associated with the identification, sharing and creation of knowledge. This requires systems for the creation and maintenance of knowledge repositories, and for cultivating and facilitating the sharing of knowledge and organizational learning. KM is the management of processes that govern the creation, dissemination, and utilization of knowledge by merging technologies, organizational structures and people to create the most effective learning, problem solving and decision making in an organization.

2.2 Knowledge management models
Perhaps one of the earliest KM models is that of Nonaka and Takeuchi (1995) (shown in Table 1). The model classifies knowledge into two kinds: tacit and explicit. According to this model, four different processes are involved in transferring knowledge, depending on its type:

1- Internalization – We learn by acquiring public knowledge. This knowledge is internalized. We obtain general knowledge from books, the internet and other public sources.

2- Socialization–We learn by socializing with other people, exchanging ideas and experiences. We observe our elders and they share their wisdom with us.

3- Externalization – Personal knowledge becomes public or explicit knowledge through documentation. The knowledge of individuals is captured, classified and stored using appropriate knowledge representations and then made available for reuse by others.

4- Combination – Here explicit knowledge from different sources is combined, mixed or connected to create new knowledge; this can be done using groupware and wikis, which usually leads to new innovations.

Table 1 Knowledge management model

		To Tacit	To Explicit
From	Tacit	Socialization	Externalization
	Explicit	Internalization	Combination

Source: Nonaka and Takeuchi (1995)

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However, this model implies a mechanistic approach to knowledge categorization, which is over simplistic, and the process of knowledge transfer is far more complicated in organizations (McAdam and McCreedy, 1999).

The Hedlund and Nonaka KM model assumes four different carriers of knowledge in the process of knowledge creation. This is an improvement over the previous model in a way that carriers can be segregated.

The Boisot model further introduced four knowledge categories:

1- Codified – knowledge that can be readily prepared for transmission.
2-uncodified – knowledge that cannot be easily prepared for transmission.
3-diffused – knowledge that is easily shared.
4- undiffused – knowledge that is not easily shared.

A critique of this model is that codified and uncodified knowledge are portrayed as distinct and discrete categories, which is not practical in practice. Diffused knowledge is rather general and it is not clear if it includes incorporating knowledge within the organization, as well as spreading it (McAdam and McCreedy, 1999).

Other models also exist, such as intellectual capital models, which ignore the political and social aspects of KM. Moreover, intellectual capital models are generally mechanistic in nature, treating knowledge as an asset similar to other assets. The socially constructed models of KM view knowledge as intrinsically linked within the social and learning processes within the organization. These models portray a more holistic approach to the process of knowledge creation.

3- Knowledge management processes and systems
A strong technological infrastructure is a prerequisite for implementing KM successfully. However, the technological aspect is not the whole aspect of KM. There is also a human-oriented approach that focuses on the management of the developers and owners of the knowledge and their activities. Both sides are essential in order to fulfill the key characteristics of KM as a whole. The purpose of a KM system is therefore to organize he storage and manipulation of knowledge. Its basic functionalities are to generate, store, distribute and apply knowledge. The processes that can be seen in a typical KM system are depicted in Figure 1.

Figure 1 The knowledge management processes (see online version for colors)

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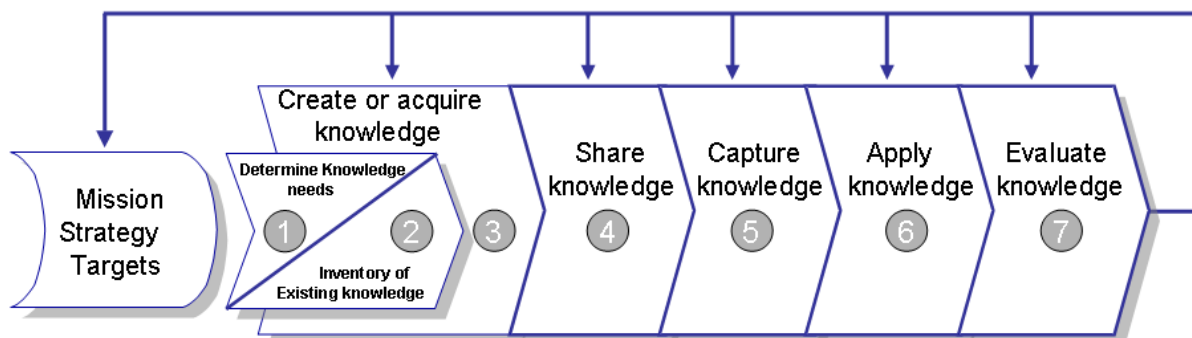
The following are the KM processes that usually take place in a typical KM model in the context of learning:

• *Knowledge creation and acquisition* – Knowledge creation and acquisition depend on nurturing people with knowledge – either individually or in teams or in communities of practice – and how knowledge is or can be acquired. The focus is on passive or unconscious knowledge acquisition.

• *knowledge sharing* – This takes place when people are genuinely interested in helping one another develop new capacities for action; it is about creating learning processes.

• *Knowledge capture* – Knowledge has to be selected, chosen and archived. Here the challenge is capturing tacit knowledge as well as explicit knowledge. It is important to establish processes in order to formalize knowledge preservation. This knowledge has to be captured and stored in databases.

• *Knowledge application* – The knowledge created and captured would then need to be applied to achieve competitive advantage.

• *Knowledge evaluation* – It must be reviewed to verify that it is relevant and accurate.

The above-described processes work in a cyclical manner as depicted in Figure 1, taking into consideration that for knowledge creation and acquisition to take place, knowledge needs should be clearly determined in the context of the organizational scope.

An inventory of existing knowledge also may exist, which helps in creating and acquiring new knowledge.

4 -ICT-enhanced learning and e-learning systems
In the scope of this paper, e-learning and online education will be defined as the formally and systematically organized teaching and learning activities in which the instructor and the learner(s) use ICT to facilitate their interaction and collaboration. This is usually referred to as e-learning, which can take several forms: Computer-Based Training (CBT), Web-Based Training (WBT), electronic support systems, webcasts, listservs, discussion forums, interactive broadcasts, *etc.*

The important common characteristic is that education is delivered through electronic devices or computers.

4.1 Main features of e-learning systems
In e-learning systems, the complete cycle of the teaching and learning process should be fulfilled. Important functional aspects within this coverage must be followed. Many of them have been exclusively developed along with research in e-learning, while others have been adapted for e-learning requirements (Paranjpe, 2003).

• *Course creation* – Throughout the instructors/teachers' experience, excellent knowledge on the creation process of e-learning contents has been developed.

This knowledge covers pedagogical, psychological and instructional issues as well as technical questions. Nearly all relevant e-learning environments offer rich authoring functionality.

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• *course management* – This important feature includes not only the functionalities of course or class deployment on the basis of existing teaching material, but also all aspects of structuring and sequencing courses. The interface to external information sources is addressed as well as the integration of practice, test or feedback modules.

• *Course administration* – Course administration includes user management, administration of access rights and all aspects of billing, which have been adapted from e-commerce and e-business solutions.

• *Learning, practicing and applying* – The most important aspect of e-learning is the learning phase. This phase includes the consumption of learning content, all communication aspects and of course all questions addressing interaction, navigation and use of e-learning contents.

• *Assessment of student performance* – An imperative part of e-learning is a continuing assessment of the learner's performance through examination and testing. Learners need to verify that they have succeeded in gaining new knowledge or skills. During this phase, the relationship between information and knowledge becomes visible with respect to e-learning. This is where it is seen whether students have been able to successfully turn information into knowledge or not.

• *Feedback* – Effective e-learning environments try to collect and take user feedback into account. Again this is a characteristic that has not yet been completely discovered, researched or effectively implemented in most systems.

5-The integration of KM and e-learning in professional development
5.1 Knowledge delivery and exchange
To a great extent, productivity and performance in today's organizations are linked to the effective leveraging of organizational knowledge. Knowledge delivery/exchange efforts focus on helping individuals make connections with subject matter experts. Knowledge exchange projects are designed to bring together knowledge seekers and knowledge sources in such a way that they can interact with one another and more effectively share tacit knowledge. Individuals can discuss experiences, engage in complex problem solving and, in some cases, observe actual work activities. Knowledge delivery and exchange techniques include orientation, training, communities of practice, expertise location, mentoring/peer assistance and alternative work arrangements.

5.2 Communities of practice
A common knowledge exchange technique, *communities of practice*, brings together individuals who are likely to have the common context to effectively preserve organizational memory. This technique provides group validation of knowledge through the vetting and evaluation of materials. Participation in communities is closely aligned with the actual work of community members, so the knowledge is likely to be timely and highly relevant to their immediate knowledge needs.

5.3 KM is on top of training/learning
Training can be organized as internal or external classroom training, or can be delivered as individual e-learning. With these e-learning technologies, training is evolving to individualized and personal training paths linked with organizational development plans in which personal skills are very important and in which care is taken for career planning. Learning can be seen as integrated in knowledge acquisition as part of the job. The following knowledge and

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communication channels are open to students and integrated in their work environment: intranet, content management tool, forum, newlines, *etc.*

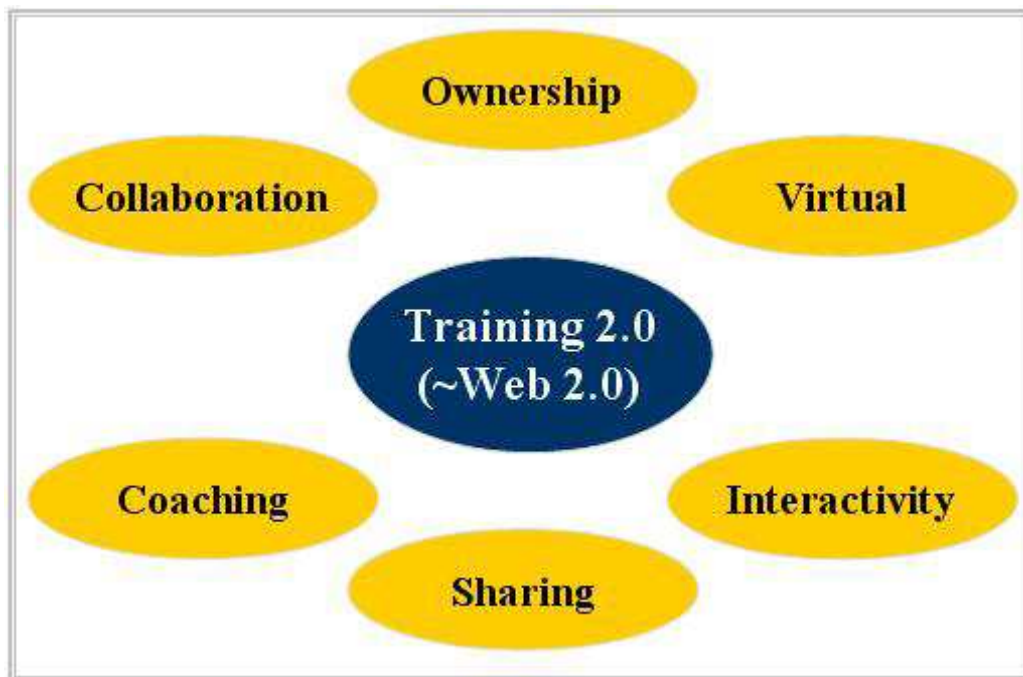Learning is no longer an individual activity, as can be seen in Figure 2.

Figure 2, How we learn

5.4 The evolution of KM and e-learning integration
As shown in Figure 3, we integrated the learning cycle within the KM cycle, showing some of the possible events that take place at each process in the cycle within the organization. For example, in the apply-learn process, peer reviews of some issues can take place. Peer assist and coaching can be organized to help understand some tasks, and an after-action review can take place as well. As in the collect/validate process, workshops for sharing information and/or success stories may be organized so that everyone can take advantage of such new knowledge and success stories.

In the communicate and distribute process, many events can occur to stimulate communication between people, including, but not limited to, Sharing Day, in which all employees gather for exchanging information related to their work areas and asking questions. To be able to further maintain and develop knowledge, community portals and knowledge cafés can be initiated. Finally, for the reusing knowledge process, old
Knowledge can be used to infer new knowledge.

6- The similarity between KM and the e-learning process
6.1 KM's impact on e-learning
It has been noted that the simple development and delivery of learning resources cannot satisfy the requirements of an information society. Professional skills achievement, knowledge sharing and exchange, and gaining competencies in specific domains of science and real life are necessary for individual and organizational success and prosperity. That is why education has to be a process of sharing and adopting knowledge, skills and competencies. The advantages of KM are very useful for that process. KM is a core part of team training, so the process of capturing

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knowledge is very similar to the processes related to the selection of the most appropriate learning content in e-learning.

The outcome of an effective learning process should be not only knowing facts for a separate subject, but also having practical skills and developing competency in the given domain, thus the acquisition of knowledge is a more precise measure of the learning outcome than learning facts for different yet related domain topics. Therefore KM processes should be more deeply and successfully integrated in learning content delivery and in the organization and support of learning.

6.2 E-learning's impact on KM processes
The desired outcome of learning should be knowledge acquisition and, in combination with some practical skills gained in the process of education, the learners have to present some type of competence. This requires that learners should be able to apply the instructor's professional duties and to execute tasks correctly. So education seems to be a very important part of the development of a successful team. Learning on demand or just-in-time training is a very appropriate form of education at work. The activities involved in formal education have to be implemented in different types of trainings delivered at organizations and institutions. This way, communication and collaboration will be improved and a free exchange of competencies will be provided. External lectures can deepen the level of expertise in a team and practical exercises in trainings can give the learners and trainees more experience and skills in the execution of their professional jobs.

6.3 Common requirements/characteristics of knowledge management and
E-learning systems E-learning and KM systems share many features. Some of these are as follows (Denning, 2000):

• *System architecture* – KM systems and e-learning environments share the same system architecture. Almost all of these systems are built into client/server architecture with most of the complexity included in the server part. Mostly implemented as slim clients offer access to the systems through the use of the internet or any other kind of network.

• *Collaboration and communication* – Both systems enable and support rather rich communication and cooperation features. Different kinds of synchronous and asynchronous communication are possible. Group scheduling, application sharing, instant messaging and other forms of cooperation are supported. These tools guarantee successful education and teamwork. Both systems also include different tools related to working in groups or different types of virtual communities. Students and teachers have to exchange information related to learning activities or specific topics of the proposed learning content. Participants in education involved in different types of groups have to exchange knowledge, skills and competencies. Employees operate in communities.

• *Personalization of delivered information* – Flexible e-learning systems and high-quality KM systems offer the possibility of personalization. The working environment can be adapted to the user needs and characteristics. Both systems are not closed or isolated. Information is most often shared among several resources and can be changed, extended, modified or removed on demand. Learning Objects (LOs) are the appropriate technology for the development and exchange of different types of information. They are small, independent units of information and can be combined in different contexts and delivered even on mobile devices.

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• *Access rules* – In both worlds, users need to be identified by the system. The users have to register. They are attached to a defined profile and they are given access to relevant information only. Most often, different layers of access rights enable the control of information access.

7-E-learning built upon knowledge management methods, models and systems
The primary mission of educational institutions is the creation, preservation, integration, transmission and application of knowledge and this is not changing in any way. One can immediately see that the mission of educational institutions is synchronized with the functionalities of KM. Thus it is logical that KM tools and technologies can be applied to e-learning in several ways.

7.1 E-learning portal
As in KM, the e-learning courses will be delivered via a portal. A portal is a single web interface that provides personalized access to information, applications, business processes and much more. Via a portal, customized information can be aggregated and integrated within a particular working environment, application or service, or a single interface be used to target individual user needs and interests. The following areas of e-learning, in which KM can be most effectively used, have been identified (Specter and Edmonds, 2002).

7.1.1 Learning from experience on a point of curriculum and course building based on knowledge in the repository
The creation of a repository of curriculum revision efforts can include information about the research conducted, effectiveness measures, best practices and lessons learnt. The repository could include information about pedagogy and assessment techniques. The guidelines for developing a curriculum includes a list of resource persons for each subject or area, subject matter experts, do's and don'ts for course design and feedback and evaluation reports for previous efforts. This would enhance the quality of the curriculum and the programmers.

7.1.2 Dynamic delivery and presentation of the content
The portal can contain a repository of content that is modularized and arranged to facilitate access to it by the content developers. The content can be organized in the form of LOs. Authorized users can add to or modify the content to keep it current. We set forward a dynamic generation of LOs or course modules customized to the learner groups regarding the content and presentation of each group, in a way to fit the preferences or characteristics of individual learners.

A dynamic LO will be created when the learner activates it, taking into account the type of learner, his/her characteristics. Based on the same source or raw content, a selection of content blocks can be brought together into the LO and to fit the course to the level of the learner. The teacher can also create more LOs with the same content, but present it in another layout fitting the preference of the users and their learning styles. The e-learning system will identify the type of device used by the learner and start the e-learning course with the most appropriate built-in presentation design.

7.1.3 A question bank used in the assessment process
Archiving previously used question sets, with representative answer sheets, can enhance the effectiveness of a student's performance assessment. This can help the faculty member in designing and developing an effective assessment process for the course. A rich and growing question bank for each topic or subject is also helpful in meeting this objective.

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7.1.4 Collaborative learning and communities of practice
Collaborative learning involves students working together in some way to aid their learning. They can do this by accessing a common set of learning materials or by posting their own queries, observations or comments on the site. The collaboration can be between two individuals or between larger groups of learners. The course coordinator can post schedules, assignments and other events on the portal. We can build on the experience we have in KM with communities of practice.

7.1.5 Strategic planning
A KM system can support the strategic planning process by creating a repository of internal and external information that is relevant to the institution, such as benchmarking studies, trend scans, current programmers on offer and data about competing institutions. There can also be links to research groups, educational publications, presentations made by senior executives and guest speakers that could provide useful information in deciding the direction that the institution should take.

CONCLUSION

The basic concepts of KM and e-learning systems have been outlined. E-learning is considered in the context of formally and systematically organized teaching and learning activities, in which the instructor and the learner(s) use ICT to facilitate their interaction and collaboration. Emphasis was made on the basic characteristics of e-learning and KM. The main task of the research is to find common features of both domains. A combination of the advantages of both domains facilitates the delivery of high-quality education for satisfying the specific educational needs of team members. An attempt has been made to identify the areas in which KM concepts can be utilized in learning within organizations and e-learning systems. The potential and limitations are briefly outlined. E-learning is definitely growing rapidly and is becoming the most common method of delivering education. The use of KM in e-learning will definitely impact the quality of the education that is delivered and the deliverability of information through knowledge and information sharing. In spite of some obstacles and limitations in the immediate implementation, it is clear that knowledge management and e-learning are the way of the future in the field of distance online education.

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