Combining and Supporting Expert Based Learning and Academic Based Learning in Developing Mobile Learning Knowledge Management System

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***Abstract* – The focus of this research is to review and realize comparative analyses of Knowledge Management, Mobile Learning, Adaptive Learning Environments, with analyses of Expert Based learning, and Academic Learning. The intersection and combination of the insights from all the reviewed and analysed concepts will be used to Develop Mobile Learning Knowledge Management System that will combine all the previous mentioned concepts. The research objective is to apply knowledge management into mobile learning and combine it with current research on personalization and adaptive learning.**

***Keywords* – Expert based learning, knowledge management, m-learning, mobile devices,**

1. Introduction

The focus of this research study is the investigation into development and analyses of mobile learning knowledge management system. Knowledge management is currently focused in business aspects rather than education. What if apply knowledge management into mobile learning and educational aspects in general and all that we combine with adaptive learning theories. Integrating knowledge management into practical educational activities and especially combined with adaptive learning applied in mobile learning is something that is not researched and represents a very interesting opportunity of enhancing mobile learner's knowledge management and problem based skills. The idea of the system is to catch the attention of the subscriber and at the very moment by inject simple knowledge cues to this attention which if desired by the subscriber may get into more details, and that way promote a proactive learning style.

2. Review of Knowledge Management

[1] defines knowledge management (KM) as a ''process of organizing and distributing an organization's collective wisdom so the right information gets to the right people at the right time.'' Another definition [1] ''a practice that finds valuable information and transforms it into necessary knowledge critical to decision making and action.''[2] goes a step further by introducing ''knowledge-level decision making based on the evaluation of new ideas for products, services, ways to communicate new knowledge, and ways to distribute information throughout the organization''.

Today the business and economic theory is increasingly concerned with the role of organizational knowledge. As a source of economic success, knowledge is increasingly seen as having displaced traditional factors of production in the post-Fordist economy [2]. Knowledge management (KM) is arguably the strategic concern for many firms [2]. Those who fail to understand this may not survive at all.

Knowledge management may provide an opportunity for extending the scope of IT-based knowledge provision to include the different knowledge types summarized in Table 1 below [3].

[3] explicated two dimensions of knowledge in organizations: tacit and explicit. Rooted in action, experience, and involvement in a specific context, the tacit dimension of knowledge (henceforth referred to as tacit knowledge) is comprised of both cognitive and technical elements. The cognitive element refers to an individual's mental models consisting of mental maps, beliefs, paradigms, and viewpoints.

The technical component consists of concrete know-how, crafts, and skills that apply to a specific context. An example of tacit knowledge is knowledge of the best means of approaching a particular customer using flattery, using a hard sell, using a no-nonsense approach.

The explicit dimension of knowledge (henceforth referred to as explicit knowledge) is articulated, codified, and communicated in symbolic form and/or natural language. An example is an owner's manual accompanying the purchase of an electronic product.
The tacit-explicit knowledge classification is widely cited, although sundry other knowledge classifications exist that eschew the recondite subtleties of the tacit-explicit dimension.

Knowledge Types	Definitions
TACIT Knowledge Cognitive tacit: Technical tacit:	Knowledge is rooted in actions, experience, and involvement in specific context Mental models Know-how applicable to specific work
Explicit	Articulated, generalized knowledge, example Knowledge of major customers in a region
Individual	Created by and inherent in the Individual Insights gained from completed project
Social	Created by and inherent in collective actions of a group Norms for inter-group communication.
Declarative	Know-about What drug is appropriate for an illness
Procedural	Know-how How to administer a particular drug
Causal	Know-why Understanding why the drug works
Conditional	Know-when Understanding when to prescribe the drug
Relational	Know-with Understanding how the drug interacts with other drugs
Pragmatic	Useful knowledge for an Organization Best practices, business frameworks, project experiences, engineering drawings, market reports

Table 1. Knowledge Types, Definitions and Examples

Level Key	Activities
Customer Knowledge	Developing deep, knowledge-sharing relationships. Understanding the needs of your customers' customers. Articulating unmet needs. Identifying new opportunities.
Stakeholder Relationships	Improving knowledge flows between suppliers, employees, shareholders, Community etc, using this knowledge to inform key strategies.
Business Environment Insights	Systematic environmental scanning including political, economic, technology, social and environmental trends. Competitor analysis. Market intelligence systems.
Organizational Memory	Knowledge sharing. Best practice databases. Directories of expertise. Online documents, procedures and discussion forums. Intranets.
Knowledge in Processes	Embedding knowledge into business processes and management. Decision-making.
Knowledge in Products and Services	Knowledge embedded in products. Surround products with knowledge, e.g., in user guides, and enhanced knowledge-intensive services.
Knowledge in People	Knowledge-sharing fairs. Innovation workshops. Expert and learning networks. Communities of knowledge practice.

Table 2. Knowledge Layers

Some refer to knowledge as declarative (know-about or knowledge by acquaintance [1], procedural (know-how), causal (know-why), conditional (know-when), and relational (know with). A pragmatic approach to classifying knowledge simply attempts to identify types of knowledge that are useful to organizations.

An understanding of the concept of knowledge and knowledge taxonomies is important because theoretical developments in the knowledge management area are influenced by the distinction among the different types of knowledge.

Knowledge management is consisting of four activities that are performed sequentially.

These activities are Review, Conceptualize, Reflect and Act.

Seven knowledge layers are possible in organizations as described in Table 2 below, Knowledge Layers [1]

Organizational knowledge assets consist of the following component assets of organizational knowledge [4]:

- knowledge in the form of experiences, expertise of individuals and groups;
- knowledge of organization that pervades its production architectures involving knowledge gathered from suppliers and collaborators; knowledge embedded in the IT systems and pertinent data warehouses and knowledge bases;
- knowledge regarding customers; and,
- knowledge shared in a global enterprise.

Critical Success Factors (CSF) In Knowledge Management Implementation is researched from many researches and in many research studies. The table 3 provides a comparative summary of some of the main issues of these studies.

Critical Success Factors \ Researcher	Alavi Leidner (1999)	Ackerman (1994)	Bama (2002)	Cros and Baind (2000)	Davenport et al (1998)
Integrated Technical Infrastructure including networks, databases/repositories, computers, software, KMS experts	x		x	x	x
A Knowledge Strategy that identifies users, user experience level needs, sources, processes, storage strategy, knowledge and links to knowledge for the KMS.			x		
A common enterprise wide knowledge structure that is clearly articulated and			x	x	x
Motivation and Commitment of users including incentives and training	x		x	x	x
An organizational culture that supports learning and die sharing and use of	x		x	x	
Senior Management support including allocation of resources, leadership, and			x		x
Measures are established to assess the impacts of the KMS and the use of knowledge as well as verifying that the right knowledge is being captured	x				
There is a clear goal and purpose for the KMS		x	x	x	x
Learning Organization			x	x	
The search, retrieval, and visualization functions of the KMS support easy	x				
Work processes are designed that incorporate knowledge capture and use			x	x	
Security/protection of knowledge					

Table 3. Critical Success Factors (CSF) In Knowledge Management

Knowledge management systems (KMS) refer to a class of information systems applied to managing organizational knowledge. That is, they are IT-based systems developed to support and enhance the organizational processes of knowledge creation, storage/retrieval, transfer, and application. While not all KM initiatives involve an implementation of IT, and admonitions against an emphasis on IT at the expense of the social and cultural facets of KM are not uncommon [5], [3] many KM initiatives rely on IT as
an important enabler.
The Knowledge Management Performance Scorecard adapts the balanced scorecard approach [4] in which an organisation measures its performance in four key result areas:

- financial performance;
- internal business processes;
- customers; and
- growth.

Eight metrics for KM analysis [3]:

- Motivation (how well the employees are motivated to work productively).
- Knowledge capture (the ability to capture important knowledge).
- Stored knowledge (the usefulness of captured knowledge in solving new problems).
- Personnel training (the effectiveness of employee learning mechanisms).
- Knowledge transfer (the effectiveness of sharing important knowledge).
- Creative thinking (the ability of employees to create new solutions).
- Knowledge identification (the effectiveness of identifying knowledge).
- Knowledge access (the effectiveness of accessing important knowledge).

3. Review and Analyses of M-learning

Many studies have given encouraging results for using mobile technologies to support students in the teaching and learning process.

Students can use cellular phones (mobiles) for many purposes: smart card usage, browsing and accessing information in Internet or browsing electronic content from computer networks, databases and distributed file system; from anywhere, anytime, with minimal technical requirements. Mobile technologies help in optimizing the learning processes and services by means of added flexibility [3] in order to access information anytime, anywhere and promise the access to applications that support learning anywhere, anytime [6]. Learning can be available and immediate at appropriate time and from any location.

Opposite to computer technology, mobile technology is not connected to physical location. It is unique in allowing ubiquitous learning and mobility in learning according to [7].

Mobile technologies can offer “just enough, just in time, just for me” model of flexible learning [2]. “Just-in-time” instruction via mobile devices is very important and giving opportunity for education to distance students. Online access to information “just-in-time” rather than searching for hand taken notes makes the leaning process more efficient.

The high portability, flexibility, immediate reachability, personality, and accessibility are very appropriate and enhance the learning process [7]. Mobile devices are easer and lower cost to supply then a computer. They are ease-to-use, supply connectivity, interactivity, providing information on real time when

needed increases user accessibility and satisfaction of the offered services in real time.

Portability and versatility make mobile devices a powerful medium for teaching and learning [8]. The portability features of mobile devices and portable and wireless technologies enable learning from anywhere, anytime without time and location constraints enable students to use their time more efficiently. Their portability and low cost offer surprising technical capabilities for the development of new systems [9].

Mobile devices perform many of the functions of desktop computers, with the advantages of simplicity (being easier to learn and use) and improved access (being usable anywhere, anytime), except the bandwidth, cost and input capabilities [6], which in most cases are the documented limitations of using mobile devices for learning.

[6] identify five properties of mobile devices (handheld computers) which "produce unique educational affordances" and those are:

a) Portability

b) Social interactivity

c) Context sensitivity, the ability to "gather data unique to the current location, environment, and time, including both real and simulated data"

d) Connectivity, to data collection devices, other handhelds, and to networks

e) Individuality, "unique scaffolding" that can be "customized to the individual's path of investigation"

In their review of mobile technologies [10] and [11] have identified the advantages of handheld devices, where is stated that 'these devices: i) are increasingly able to carry media-rich content and thus to support a conception of teaching focused on the teacher and on the content, ii) increased interaction with educational materials, for example the capacity to bookmark and annotate them, will strengthen this'. Mobile devices, besides supply text functions, Internet access, audio and video capabilities.

There are advantages in using a mobile device offering individual, private and learning at own pace and learning within specific contexts which can provide 'reliable cultural and environmental indications for understanding the uses of information which may enhance encoding and recall and enable learners to access relevant information when and where it is needed' [11].

4. Review and Analyses of M-learning Projects and Trends

According to [6] an increasing number of colleges and universities are adopting mobile wireless technologies as teaching and learning tools. According to [6] more than 90% of public universities and 80% of private universities in the US have some level of mobile wireless technologies, such as mobile wireless devices and networks.

According to [10] and [11] mobile wireless devices, tablets, PDAs and handheld devices are used most often in the learning environments.

According to [6] The New York City public schools in have ordered more than 2,000 iPad tablets, 300 went to Kingsbridge International High School in the Bronx, or enough for all 23 teachers and half of the students to use at the same time.

More than 200 Chicago public schools in 2010 year applied for 23 district-financed iPad. The Virginia Department of Education is overseeing iPad initiative that has replaced history and Advanced Placement biology textbooks at 11 schools. And six middle schools in four California cities (San Francisco, Long Beach, Fresno and Riverside) are teaching the first iPad-only algebra course .

In Europe a research conducted by [3] involved mobile blended learning technologies to support HND computing students at the University of Wolverhampton.

The objectives of this project were to develop, deliver and evaluate blending learning opportunities that exploited SMS, WAP and VLE technologies. Initial research indicated that students used SMS text messaging promptly and effectively, and that they would prefer to receive notice board information such as room changes, appointments, feedback and exam tips via SMS rather than via e-mail or notice boards. SMS-based interventions took place over the second semester of the 2002-2003 academic year.

Initial test messages gauged the effectiveness and the level of timeliness of student responses to SMS text messages. A second set of messages was sent as feedback following the marking and moderating of assessments. During the trial, the students provided considerable positive informal feedback to the course leader, and a questionnaire administered to the students revealed that the majority of students thought the experiment was worthwhile.

Regarding to m-learning projects it has been found that the majority have been focused on improving interactivity in the classroom [11], [6] or on increasing students' access to learning materials anywhere, anytime as described by [7].

A smaller number of projects have focused on supporting on-the-job training in the field, largely for medical and nursing students in hospitals [8].

A few projects have included teaching students some aspect of mobile technology, such as programming mobile devices or using stylus technology, usually in connection with ubiquitous delivery [12]. Occasionally projects have combined ubiquitous delivery with a focus on interactivity with a single pedagogical focus. Several m-learning projects focus on how to apply e-learning techniques and content on mobile platforms.

Several other free and commercial mobile language learning programs have recently become available [3]. Te BBC World Service's Learning English section offers English lessons via SMS in Francophone West Africa and China; BBC Wales has similarly offered Welsh lessons since 2003 and an EU-funded initiative known simply as 'm-learning' provides English lessons directed towards non-English speaking young adults.

A small number of projects span over more than one discipline area, for example [11] interactivity study in computer science and education.

Most projects focus on only one type of mobile device. Such project's need to expand into multi-institutional, multi-disciplinary approaches so that the outcomes are relevant to the widest community possible, using actual case studies in real class situations over a variety of subjects and education environments. The UniWap project for developing and testing purposes use smart-phones and WAP phones.

Under the auspices of the European Union, the 'e-learning to m-learning' project establishes the first stage in the creation of the global provision of training on the wireless Internet [12], promoting and reinforcing the contribution to be made by vocational training. "From E-learning to M-Learning" is a long-time project that seeks to put in place a new virtual learning environment for wireless technologies and to develop course materials for a range of devices in this learning environment. The main pedagogical problems of developing mobile learning for PDAs [12] were solved in the project. The authors discuss the devices characteristics that are proper for learning and underline the move from d-learning (distance learning), e-learning, to m-learning. They attempt to predict which methods and technologies should be used for successful m-learning. 'Specifically and practically, this project will map the evolution from the wired virtual learning environment of today, to the wireless learning environment of tomorrow'.

5. Review and Analyses of Adaptive Learning environments

The ideal of individualized learning (i.e., learning tailored to the specific requirements and preferences of the individual) cannot be achieved, especially at a "massive" scale, using traditional approaches. Factors that further contribute in this direction are different and among others include the diversity in the "target" population participating in learning activities.

Analyzed were several projects and research initiatives that deal with personalization have been shortly reviewed. The reviewed projects are the OPen Adaptive Learning Environment (OPAL), [6] and ADELE-Adaptive e-Learning with Eye Tracking [6]. The OPAL research shows personalization as difficult to achieve and "… are often expensive, both from a time and financial perspective, to develop and maintain" [6]. Therefore, a conclusion is drown that learner personalization should not been addressed at to finely grained level. Typically, personalization at that starting level is not practical based on the findings of OPAL project [6] and since it has too include all of those learners preferences that change each time the learner uses the system clearly does not represent a constant factor that can be addressed [10]. Instead, a recommendation is to use the defined approach with e-learning indicators as starting point when developing an e-learning initiative. Then after the measurements the learners are divided into groups so called "collectives" (in Universities these are the departmental levels) were personalization is offered to the specifics of the collectives majority primarily based on learning style categorization and type of learner they are. We have adopted the Felder-Silverman model for learning style categorization [13]. After that learner personalization can be designed and offered tailored to each collective [6]. Furthermore, based on the measurements of these e-learning indicators a design of a sustainable e-learning initiative can be supported. Each e-learning initiative is unique and involves specifics that cannot be taken under consideration in the form of "one-size-fits-all" solution.

According to [3] there are four categories of Adaptation in Learning Environments. The first category, Adaptive Interaction, refers to adaptations that take place at the system's interface and are intended to facilitate or support the user's interaction with the system, without, however, modifying in any way the learning "content" itself. Examples of adaptations at this level include: the employment of alternative graphical, colour schemes, font sizes, etc., to accommodate user preferences, requirements or disabilities at the lexical (or physical) level of interaction; the reorganization or restructuring of interactive tasks at the syntactic level of interaction; or the adoption of alternative interaction metaphors at the semantic level of interaction.

The second category, Adaptive Course Delivery, constitutes the most common and widely used collection of adaptation techniques applied in learning environments today. In particular, the term is used to refer to adaptations that are intended to tailor a course (or, in some cases, a series of courses) to the individual learner. The intention is to optimise the "fit" between course contents and user characteristics / requirements, so that the "optimal" learning result is obtained, while, in concert, the time and interactions expended on a course are brought to a "minimum". In addition to time and effort economy, major factors behind the adoption of adaptive techniques in this context include: compensating for the lack of a human tutor (who is capable of assessing learner capacity, goals, etc., and advising on individualized "curricula"), improving

subjective evaluation of courses by learners, etc. The most typical examples of adaptations in this category are: dynamic course (re-)structuring; adaptive navigation support; and, adaptive selection of alternative (fragments of) course material [7].

The third category, Content Discovery and Assembly, refers to the application of adaptive techniques in the discovery and assembly of learning material / "content" from potentially distributed sources / repositories. The adaptive component of this process lies with the utilization of adaptation-oriented models and knowledge about users typically derived from monitoring, both of which are not available to non-adaptive systems that engage in the same process.

The fourth and final category, Adaptive Collaboration Support, is intended to capture adaptive support in learning processes that involve communication between multiple persons (and, therefore, social interaction), and, potentially, collaboration towards common objectives.

This is an important dimension to be considered as we are moving away from "isolationist" approaches to learning, which are at odds with what modern learning theory increasingly emphasizes: the importance of collaboration, cooperative learning, and communities of learners, social negotiation, and apprenticeship in learning (Wiley, 2003).

6. Expert Based Learning versus Academic Learning

According to [3], adaptive learning systems have traditionally been divided into separate components or 'models'. While different model groups have been presented, most systems include some or all of the following models (occasionally with different names):

- Expert model - The model with the information which is to be taught
- Student model - The model which tracks and learns about the student
- Instructional model - The model which actually conveys the information
- Instructional environment - The user interface for interacting with the system.

Currently there is no research about Expert based learning. Expert Based Learning is synonymous with learning in depth from expert in the field either from his/her project or interacting with the expert on a forum type system. A well-designed project provokes learners to encounter (and struggle with) the central concepts and principles of a discipline and gives a lot of insights how to approach and do something and a finished project from an expert can be extremely good source of knowledge when provided as template to learn from.

Performance is assessed on an individual basis, and takes into account the quality of the work produced, the depth of content understanding demonstrated, and the contributions made to the ongoing process of project realization. On the other hand the academic learning is organised in semester (15 week) based learning were the content is provided and organised in strictly organised lectures and practical's that ensure the learning and entire knowledge is gained in the process.

7. Conclusion

This study attempted to resolve some of the definitional and methodological difficulties encountered by previous researchers. It involved review and comparative analyses of Knowledge Management, Mobile Learning, Adaptive Learning Environments, with analyses of Expert Based learning, and Academic Learning.

Contemporary learning theory suggests that individual learners differ in the way they learn and that learning must be tailored to the individual learner. Consequently, learning environments must have the flexibility to adapt themselves for the individual learner.

In the near future, it is expected that learning will move more and more outside the classroom and lectures halls into the learner's environment both real and virtual negotiated by mobile devices.

The significance of the research is based in the fact that almost every student has a mobile device at all times while not everyone has a computer and internet connection at all times. The excepted impact is in providing information and this system to open the doors for the community, parents and other parties who somehow are interested or have stakes in the learning and the time of delivery of content. This way the knowledge management system will involve the community and will create more opportunity for knowledge transfer, thus increasing the likelihood of change induced by the knowledge in the target audience.

A conclusion drawn from the experiences from these projects show that a more successful e-learning is not possible only if a generic approach or generic guidelines for the learners are applied. Rather, individual learning services are needed in supporting learners according to their personal preference profile.

The results of the reviewed research show that m-learning indicators approach is of primary importance [10]. Having a standardized set of m-learning indicators accepted by scientific community enables comparison and evaluation of different m-learning initiatives and their m-learning projects in a systematic manner. Moreover this approach combined with experimental

approach to m-learning can bring new insights into the specifics of m-learning that might help in increasing the learning outcomes, especially knowledge transfer.

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