THE ECOSYSTEM FRAMEWORK FOR U-LEARNING IMPLEMENTATION THROUGH COURSEWARE DEVELOPMENT AND MANAGEMENT

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Abstract

One of the serious problems faced by mostly developing country is a relatively low higher education gross enrolment rate. Several breakthrough programs have been initiated by education practitioners to solve this issue, including the adoption of open education concept through the implementation of e-learning. The issue of e-learning occurred as such approach requires and consumes learning resources that are difficult to acquired and developed. Nowadays, the way of designing online courses have been left behind, replaced by a new emerging concept of ubiquitous learning (u-learning). This emerging 21st century conception lies upon the principle that learning can be done from anywhere, anytime and anyhow - through the utilisation of information and communication technology. The application of u-learning in formal education can be held effectively and efficiently should it is done in a systemic and holistic way. This article proposes a strategic ecosystem framework for effective u-learning implementation. A courseware approach is being selected as a vehicle to conduct learning activities within u-learning environment.

Keywords: online course, e-learning, courseware, u-learning, framework, ecosystem

INTRODUCTION

A good number of studies in u-learning have been conducted by various educational scholars to investigate how u-learning operate in various context of learning. In the context of formal education, the concept of u-learning is being used as a paradigm in developing courseware. Since courseware is only a small part of a larger system, education practitioners should be aware of the ecosystem as a whole. This paper proposes an architectural framework of the u-learning ecosystem implementation through courseware development and management.

This proposed framework is developed by using a synthesis methodology after conducting a series of research, observation, and investigation of u-learning implementation in twelve countries, such as: Australia, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Singapore, South Africa, Thailand, United States, and Vietnam.

In this study, secondary data are collected from various policy makers and education practitioners in respected countries, while the primary ones are coming from the gatherings where scholars of u-learning studies meet, share, and exchange ideas.

The type of synthesis methodology that is used in this study is framework synthesis (Brunton, et al., 2006; Oliver, et al., 2008). Framework synthesis is based on framework analysis, which was outlined by Pope, Ziebland and Mays (2000), and draws upon the work of Bryman and Burgess (1993) and Miles and Huberman (1984).

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LITERATURE REVIEW

Basically, the concept of u-learning is a continuation of the evolution of "electronic learning" (e-learning) and "mobile learning" (m-learning) – as a consequence of paradigm shift in education from closed to open learning system. U-learning that works on a principle of convenient learning from anywhere, anytime, and anyhow is spawned a variety of innovative learning approaches (Bomsdorf, 2005) - such as collaborative learning, authentic learning, and context-aware learning (Chen et al., 2009). Technological development that gives birth to products like mobile phones, electronic devices (gadgets), cloud computing, wireless tissue, and others become the main promoter of the conception of u-learning (Vladoiu, 2012). Even Ogata, et al., (2008) confirms that the latest technology such as RFID (Radio Frequency Identification) and Augmented Reality drive the development of u-learning concept in education.

U-learning that is strongly influenced by the humanism, cybernetic, and cognitive psychological orientation is built upon two several basic approaches, namely: (i) individual independent exploration of learning by utilising ready to use resources; and (ii) social interaction of various parties that relate to the knowledge being learnt. Yang, Okamoto & Tseng (2008) identifies eight characteristics of u-learning environment, which are: (i) mobility; (ii) location awareness; (iii) interoperability; (iv) seamlessness; (v) situation awareness; (vi) social awareness; (vii) adaptability; and (viii) pervasiveness.

In essence, the application of u-learning has transformed the way people learn things (Cope & Kalantzis, 2009). Tan, et al., (2012) characterizes the u-learning as a system that has the characteristics of permanency, accessibility, immediacy, interactivity, situation, calmness, adaptability, seamlessness, and immersion (Liu, 2009). Because it is supported by information and communication technologies, the learners can easily move from one place to another, across space and time, without having to fear a disruption of the activities of the learning process. In short, u-learning works on top of three domain platforms: learning collaborators, learning contents, and learning services (Chang & Sheu, 2002; Cheng, et al., 2005; Haruo, et al., 2003).

DISCUSSION

Essentially, there are eight (8) major components of the u-learning framework that constitutes a holistic ecosystem, which are: (i) learners; (ii) courseware development and instructional design; (iii) superstructure; (iv) governance; (v) management; (vi) technology; (vii) resources; and (viii) space environment (see Figure 1: The INDRAJIT’s Ecosystem Framework for U-Learning Implementation). The following is a brief explanation of each component in the context of the implementation of open courseware based u-learning.

Learners

The center of learning process lies on the learners. They are the controllers and navigators of u-learning activities. As main component, learners are directly related to the courseware they take in the study program. They are also the ones who operate and utilise information technology to select learning materials and resources from anywhere, anytime, and anyhow. Within u-learning environment, learners “talk”
and interact with the world of knowledge intensively by technological devices as learning tools.

Most practitioners are facing paradoxical phenomena shaped by the nature of formal education and ubiquitous approach of learning - which is perceived to be more informal. With this regards, instructional design plays crucial role to handle such issue. Laroussi (2004) introduced the term pedagogical socio-cognitive paradigms and distributed cognition to describe the approaches and paradigms used in implementing u-learning. In this view, the learning process is designed to enable a cognitive interaction between learners and their surrounding social environment, through a model of collaborative learning, problem based learning, informal and ad-hoc learning, authentic learning, and so forth.

The fundamental difference between u-learning and its predecessors such as e-learning and m-learning lies in how technology is able to predict information, knowledge and contexts required by learners (Hwang, Tsai, & Yang, 2008). By utilising smart yet complex algorithms, a context-aware u-learning system can study the habits and behaviour of learners, as well as the characteristics of associated surrounding environment. This capability makes the system being able to predict what resources and learning materials are needed. This implies that in terms of pedagogy and design instructional, learners are conditioned to perform their own learning in an independent contextual way. Learners are welcome to gather as much learning portfolio as possible, that are considered as an integral part of achieving learning objectives or outcomes that have been set. In a context where a course is designed to integrate face-to-face with u-learning model, a concept of either hybrid learning (h-learning) or "blended learning" is introduced (Zhang, 2005). Special characteristics of u-learning concept that greatly affect instructional design model are: omnipresence, context customization, interactivity, self-directed learning, and perceived enjoyment (Jung, 2014).

Courseware Development and Instructional Design

The term "courseware" is being used to represent the packages or modules of lectures in the form of digital/electronic, which is delivered through online learning process as teaching material. Components of such online courses can be essentially translated into four distinct models: (i) Domain Model; (ii) Learning Context and Pedagogy Model; (iii) Learning Resources Model; and Courseware Model (Melia, 2009) – offering a flexible, exciting, and innovative way of learning (Frommann & Tan, 2006). The first adoption of u-learning is done through the implementation of appropriate instructional design approach, which is based on the design of contextual learning model (Vladoiu & Constantinescu, 2011). The design itself is coming from the convergence of formal, non-formal and informal education mode. Basically, the development methodology of open courseware can be categorized into six stages, namely: (i) planning; (ii) design; (iii) development; (ii) application; (v) control; and (vi) assessment/evaluation. And the last domain is superstructure, whose main function is to produce and to run appropriate rules and standards necessary to implement u-learning initiative.
Figure 1: The INDRAJIT’s Ecosystem Framework for U-Learning Implementation
By definition, a courseware is a mean for learners to achieve its learning goals (competencies). Therefore, the process of designing online courses, which are integrated with the concept of u-learning, is a very crucial process that should be well undergone by campus. This means that instructional design is the key determinant of either success or failure of the implementation of courseware-based u-learning. In terms of learning outcomes, there should not be a difference between the competencies of learners that are achieved through e-learning program and conventional face-to-face mode. As courseware being implemented in formal higher education environment, any u-learning course shall be designed, constructed, developed, applied and evaluated in a good quality manner.

As formal institution, a college must abide by the philosophy, principles and universal values of education and learning. Regularity within a campus is one of the traits and characteristics of scientific community that must be upheld. Online course or courseware as an entity or a component in the ecosystem is designed and developed through a series of standardized instructional design process. From time to time, the development approach and mechanism of courseware is updated and revised due to the dynamic technological and pedagogical change (Archer, Garrison & Anderson, 1999). Integrating the concept of u-learning that rests on the freedom of students to choose their own teaching materials from anywhere, anytime, with the conventional pedagogical approach in education have been a challenge in the field of instructional design (Zinn, 1990). A designer has a responsibility to analyse and to develop coursewares that align with u-learning perspective and paradigm. Understanding u-learning in a holistic way involves a need to understand a broad perspective of the matter, where various components are interconnected, influential, and integrated.

**Superstructure**

A presence of superstructure that is designed and developed by the government as a regulator should be well orchestrated in u-learning environment. Through laws, regulations, standards, and policies, the government provides guidance for higher education providers to carry out mandated authority in implementing effective, efficient, and well-controlled learning process. The main role of superstructure is to ensure that university is running u-learning initiative in quality. As a formal educational institution, campus operates within systematic higher education environment - as regulated by the government. A learning process that is designed for the students is encapsulated in the form of courses. At the time while e-learning concept is introduced, online courses come to the fore, as a cavity activism of learning where learning resources (faculty and teaching materials) can be accessed by learners located in different place at different time through the utilisation of information and communication technology (Pankratius & Stucky, 2005).

A good u-learning initiative should be delivered in compliance with standards, such as learning outcomes, learning process, content and materials, lecturers and educators, facilities, evaluation, institution management, and financial cost. In most countries, such initiative should comply with distance education (distance education) regulation, principles, policies, and framework. This distance education standard itself is referring to a number of "good practices", as issued by ISO (International standards Organisation), ITLET (Information Technology for Learning, Education and Training), SC36 (Standards Committee 36), and JTC1 (Joint
Technology Committee 1). This standard concerns with the implementation of online course materials and electronic/digital material format (Stoica & Ghilic-triggering, 2009).

**Governance**

Every operator of u-learning should have appropriate instruments to help them implementing the initiative in an effective and efficient way. At the same time, the implementation and management of courseware-based u-learning must stay in tune with the philosophy, values, benefits, and culture of education. This domain confirms that in carrying out its operational activities, the university should be always in harmony with its vision and mission(s). Governance mechanism that is manifested in various forms - such as through the existence of the assembly of trustees, code of ethics, rule of conducts, and corporate values - becomes a strong foundation for campus leadership. Similarly, in designing and implementing u-learning courseware that have a dimension of freedom, openness, independence and freedom, the need to maintain and to value academic practices should be fulfilled. Governance is directly related to the activities of making sure that learning activities are carried out completely in tune with the philosophy of education and the learning itself. Such aspects include principles, rules, policies, mechanism, processes, and culture - whose existence is to ensure that benefits of u-learning far surpass the cost or risk faced by the educators (Baruque & Melo, 2004). In the context of online learning, this aspect is often referred as e-governance (Panda & Swain, 2009).

**Management**

Basically, universities should apply the right strategy to fulfil their mission and vision through the utilization of resources within their possession. As stipulated by the most regulations or quality standards, only academic institutions who have good reputation and accreditation that can be officially mandated to conduct online courses. These facts bring a meaning that the universities who have been appointed should be able to plan, design, develop, execute, and control the implementation of u-learning that has the same quality with its legacy system. A good management practices should be applied with this regards. Management is a series of activities related to the fulfilment of vision and mission of the organization through u-learning resource utilization. Although classified as a non-profit organization, in this regards, a modern university should work as befits a corporation (Nay, 1995). This is due to the fact that a university is bound by limited resources to achieve its vision and mission(s) proclaimed.

**Information and Communication Technology**

Technology holds a crucial role in u-learning ecosystem because it becomes a learners medium to touch the virtual arena where knowledge repositories are located. By utilizing various technological components (hardware, software, netware, infoware, etc) through various access tools (computers, devices, gadgets, notebooks, and mobile phones), learners can freely and seamlessly implement learning activities within a ubiquitous environment.

In the context of u-learning, the role of computing technology (computers, information, and communication) is as medium that connects students (learners) with a variety of learning resources through cyber space or internet (Krumm, 2009). A ubiquitous environment is shaped by a wide range of information and communication
technologies, such as hardware (hardware), software (software), network devices (netware), a data storage device/information (infoware), access devices (devices or gadgets), infrastructure telecommunications, and others. In accordance with the concept of ubiquitous that rests on the ability of technology to adapt with learning needs of students, all components of this technology are designed to facilitate adaptive learning (Jones & Jo, 2005). Architecture wise, learners need the tools and the access channels to associate him with any virtual arena of learning. Those tools include desktop computer, notebook, electronic devices (gadgets), digital slate (tablet), and other technology tools (Garg & Goel, 2013).

Learning Resources

Various knowledge needed by learners to achieve targeted competencies is produced by various learning hubs, in both physical and virtual (electronic/digital) forms. Because of its diversity, learners need a variety ways to access them. Technology is a major tool in accessing resources for learning. Learning resources available in campus environment are coming from both physical assets and virtual arena (internet network), which have been packaged in such organized way. U-learning concept assumes that learning resources can come from anywhere, in the shape of physical, electronic, digital, or virtual matters. Any entity has a potential to become source of learning. If conventional learning environment has lecturers, instructors, researchers, books, laboratories, and libraries as a source of learning, in a virtual digital environment, various terms such as e-lecturers, e-books, e-library, and e-laboratory, are introduced (Wiley, 2000). As seen in the architecture, the physical and digital environments jointly form the diverse learning arena connected to each other (Yu, et al., 2014). Learning resources can be located in the territory or perimeter of campus, or off-campus. Learners in this context are considered as content consumers who enjoy the products of content provider, which are produced, packaged, and supplied by content service providers (Sung, 2009).

Learning Arena

Internet and networking technology form a collective pool of data centres and integrate various knowledge sources scattered all over the globe. This giant network contains a wide range of useful knowledge required by learners. Seeing so much data, information, and knowledge that are scattered everywhere and are diverse in formats and characteristics (structured vs. destructor, formal vs. informal, centralized vs. distributed, single vs. multimedia, etc.), it takes a smart engine system to filter relevant knowledge that meet the needs of learners. The virtual arena of learning or Virtual Learning Environments (VLE) is defined as a commonplace in modern teaching and learning context where pedagogical activities are being conducted (Ribs, 2009). VLE itself takes a form of various emerging systems, such as: personal learning environment (Oliver & Liber, 2011), cloud computing environment (Charley, 2010), virtual machine environment (Soror, et al., 2010), dynamic mobile environment (Franco, 2010), and so forth. This virtual learning space has tight interaction with various knowledge sources and repositories available that can be accessed by learners. These systems are operated on the top of u-learning platform that is equipped with smart algorithm and artificial intelligence programs - that enable themselves to filter learning materials that are suitable with the unique needs and characteristics of learners (Byun & Cheverst, 2004).
CONCLUSION

Moving towards u-learning is not an option, but a must effort for modern campus. The rapid development of information technology, renewal theory and the concept of dynamic education, human characteristics in different generations, and the nature of globalization, are the reasons for such proposition. A higher education institution must respond these challenges by doing transformation in teaching and learning activities - so that the campuses are remain relevant to the circumstances of the modern era. As an organization in formal education environment, universities must have an effective strategy in adopting u-learning concept into learning models. An online course is one of the most appropriate vehicles to start promoting u-learning into the college environment. Through the presence of u-learning online courses that are openly accessible to anyone in need, anytime, and from anywhere, the problem of low higher education gross enrolment rate can be solved. This Strategic Ecosystem Framework for Governing and Managing Open Courseware in Ubiquitous Learning Environment is developed to serve the need of a guide for university leaders who want to implement such initiatives in a holistic and systemic way.

Since this framework is developed after thorough understanding and comprehension of the system in twelve countries only, there might be several components of the ecosystem that remain unnoticed. A further study is recommended to be undertaken to investigate this matter – especially the one that includes European countries that are not used as samples in this research.

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