T. Hirashima et al. (Eds.) (2011). Proceedings of the 19th International Conference on Computers in Education. Chiang Mai, Thailand: Asia-Pacific Society for Computers in Education

Educational Process Reengineering and Diffusion of Innovations in Formal Learning Environment

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Abstract: In technology mediated learning while relative advantages of technologies is proven, lack of contextualization and process centric change, and lack of user driven change has kept intervention and adoption of educational technologies among individuals and organizations as challenges. Reviewing the formal, informal and non-formal learning environments, this study focuses on the formal part. This paper coins the term 'Educational Process Reengineering (EPR) based on the established concept of 'Business Process Reengineering (BPR) for process improvement of teaching learning activities, academic administration and evaluation and assessment. Educational environments are flexible and not governed by standard operating procedures, making technology use lithe. Theory of 'diffusion of innovations' is recommended to be integrated to reason and measure acceptance or rejection of EPR selected technology and address root cause. Future work is to elaborately demonstrate use of proposed conceptual process design for integrated education process reengineering and diffusion reasoning.

Keywords: diffusion of innovations, technology enhanced learning, formal learning environment, educational process reengineering

Introduction

Information and Communication Technologies (ICTs) in education generally termed *eLearning* is the field of interest for scholars primarily from the disciplines originating from education or pedagogy and computer science and engineering or IT. The core objective of research being "*to improve the education system*" remained far from catching up with adoption compared to the progress made in the field of "*e"* in the dot com and tech boom era. Formal, informal and non-formal learning environments are different contexts of education or learning. Appropriate use of ICTs for improved learning achievements gave rise to constellations of questions. Much of the effort had been around the question "how to select and/or how to adopt ICTs for improved teaching-learning process?" This resembles the quest of business entities to improve business processes. However, Business Process Reengineering [3], [6] have enabled business entities to successfully redesign process for performance improvements and embrace technology after the initial ICT adoption failures. *eLearning* field lack such an approach. Theory of diffusion of innovations [13] faciliatates reasoning adoption or non-adoption by individuals and within or among organizations, and guides change agents to diffuse among the targeted users. For eLearning initiatives to effectively implement ICTs for both education and administration, diffusion theory has much to contribute. *Given the scope for a need for generic approach or methodology for* "formal educational process and practical improvement with ICTs", *this paper has the following objectives.*

Objectives

- To review contexts of formal, non-formal and informal learning environments.
- To introduce with the concept of Educational Process Reengineering (EPR) for formal learning environment
- To relate diffusion of innovations with EPR for educational technology adoption
- To integrate conceptual model of EPR and diffusion processes for formal learning environment

1. Learning Environment as Contexts of Education

Increasing emphasis is given on the context and place of educational experiences [14] based on the understanding that learner is embedded to the contexts and thereby experiences and outcomes are shaped [12]. The term context is an inter-connected and often inter-dependent network of factors including content, pedagogy, assessment, control, location, relationships, organization, supervision and schedules [14]. Formal, non-formal and informal learning environments are the three broad educational contexts [10] that can provide different educational experinces with technologies. Each of these contexts include different constellation of factors for experiencing education differently (with or without ICTs) [2]. Formal learning environments include elementary school through universities, which have hierarchical levels, recognition and inter-related grading systems [10]. Non-formal learning environments are organized settings (e.g. after-school activities, self-help groups, in-service training, educational programs of radio of television) but highly flexible through which diffusion communication is conducted by "*change agents"* [13, pp. 335-370] through learning process [10]. Informal learning environments are embedded with the daily social activities and life, in which context every individual attain skills, attitudes, values and knowledge from natural situations, from family, neighbors, and peers; play and work; and public places like library and marketplace; and mass media [10]. Claiming to contribute by coining "educational" process reengineering this paper attempts to contribute to formal context only, which focuses institutional processes but considers individual role and autonomy aspects as well. However, informal learning constitutes the largest portion of learning experiences (mostly not formal curriculum related), with long-lasting results which transpires over time [14], and is highly effective [12]. Therefore, the greater part of the challenge yet remains as a future scope.

2. Information and Communication Technologies in Formal Learning Environment

Defining ICT has become complex with the rapid advancements of mixed media (e.g. 3G Smart phones, iPad, iPod etc.), mixed information services delivery centres (e.g. telecentres) [7] along with the mass media technologies and, educational technologies (e.g. Smartboard, clicker etc.). Use of ICTs, particularly computer and Internet, covers the largest proportion of literate in formal contexts discussed on cognitive, attitudinal and academic outcomes [11], [9], along with effective pedagogy [1] integrating technologies in teaching-learning process on curricular content. The holistic organizational goal, policy, stakeholder requirements and performance parameters of the processes embedded in formal educational environments had not been addressed significantly. Proposed Educational Process Reengineering (EPR) is expected to contribute by selecting, prioritizing, appropriating and training ICTs for improving teaching-learning process through each educational institute's initiatives.

3. Educational Process Reengineering with Information and Communication Technologies

The concept of *Educational Process Reengineering (EPR)* is based on Business Process Reengineering (BPR). BPR is defined differently by scholars with different core focuses. BPR is an analysis and design of work flows and processes within and between organizations [3], which stresses on process redesign. BPR is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in prioritized performance indicators or measures, such as quality, cost, time, service, and speed etc. [6], which stress on reengineering with performance improvement. O'Neill & Sohal [16] conducted extensive literature review on definition, tools, challenges and process contexts of BPR, which focused on the business organizations. Among these approaches, the concept of fundamental rethinking and redesign [6] can be applied in educational institutes for the administration and teaching learning processes. Draheim [4] discussed that in order to implement technology tools, especially the enterprise resource planning applications, organizational processes are redesigned and reengineered. The application of the technology is also adopted by users and organizations to meet the process context.

In the context of education this paper proposes the term "Educational Process Reengineering" for performance improvements of teaching learning activities (TLAs) [17, pp. 104-162], educational evaluation and assessment [17, pp. 195-246], and academic administration. In most cases *Academic* or *educational administration* including registration, exam plan, accounts etc. follow "standard operating procedures" and some institutes have reliably adopted technologies for operations, maintenance and management. However, the flexible part of curriculum specific processes involving teachers, students and secretaries or administrative personnel require much attention as technology enhanced learning integration has become popular and lacks a scientific approach. Going through the process of *EPR* institutes can select appropriate technologies to improve the core teaching-learning processes. Based on the detailed methodologies for BPR [15] fig.1 depicts the EPR project phases. *Project preparation* phase will include briefing the decision-making management about the process of project methodologies and request for organizing groups of users (i.e. teachers, students and academic administrative personnel). *Phase 2* will be to organize separate groups of stakeholders from each department of academic disciplines with different practices. A separate mixed group of stakeholders will be organized for joining in the phase 5. Multi-disciplinary team will be organized including experts from pedagogy (both teaching-learning activity and assessment), educational technology (the service provider) and project initiating organization's policy and practice. *Phase 3 on AS-IS process modeling* will result in the current practice process flow charts for each department from workshops of each stakeholder groups, moderated by the service provider. *Phase 4 on TO-BE process modeling* will be considering the AS-IS process modeling in participation of expert groups. The technology experts will begin with the recommended process with the alternative ICT selection suggestions. Pedagogy experts and the policy and practice experts will address the required change managements. The outcome would be a documented agreement and policy update by the educational institute for acceptance of changes. *Phase 5 on ICT or software evaluation* will start with mixed stakeholder group workshop followed by separate groups for feedback on alternative ICTs. Prioritized ICT will be selected and approved by groups and organization decision-makers. *Phase 6* will begin diffusion communication appropriate for the organization and users as a continuous process. *Phase 7* having overlapping with phase 6 will initiate system implementation.

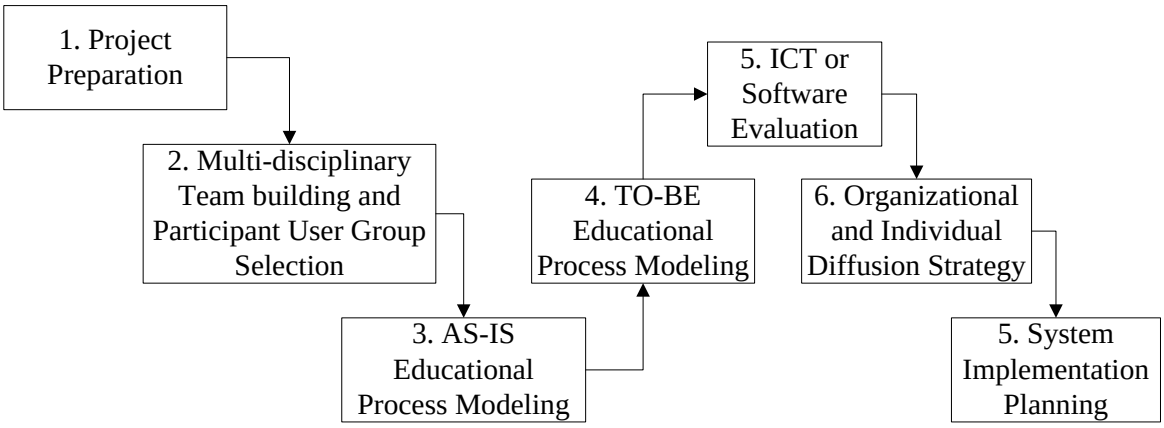

Figure 1: An Overview of the Methodologies for EPR and for Educational Software Selection (Adapted from [15])

4. Theory of Diffusion of Innovations

This paper takes Roger's [13, p. 4-7] standpoint for the word *diffusion* which includes both the planned and the spontaneous spread of new ideas, which is addressed in the approach of EPR methodlogies. Access to new ICTs and software tools enables adoption in educational contexts and changes practices. While teachers and administrative personnel typically remain for longer years with an institution, students do not. The dynamics of social change among students using some technologies and the teachers being from a 'different age' for the newer students might create 'technology led social gap'. Furthermore, "technology transfer should stress *context* over *content* and *process* over *prescription*" [5, p.317]. The transfer of technologies is required to be from the educational institute for teachers and academic administrative personnel to best diffuse the technology. The characteristics of the technologies can be diffused with precise communication channels. A *communication channel* is the means by which messages get from one individual to another [13, p. 18]. These channels can be grouped into *mass media channels* (radio, television, newspaper, community radio), telecentre [7], *interpersonal channels* (face-to-face and information support centers), and multimodal or multimedia (mobile, computer and Internet tools). Through communication three types of knowledge are exchanged, which are, *awareness knowledge*, *how-to knowledge,* and the underlying functional *principles-knowledge.* For transfer of knowledge, either needs or awareness of innovations can come first [13, pp.162-165]. "A *need* is a state of dissatisfaction or frustration that occurs when one's desires outweighs ones actualities, when *wants* outrun *gets"* [13, p.164]. In situations, one might *want* something but not *need* it. Incentives or subsidies (as relative advantage) speed up the rate of adoption. Incentives can take variety of forms, e.g. adopter versus diffuser, individual versus system, positive versus negative, monetary versus nonmonetary, immediate versus delayed [13]. Diffusion of educational technologies among teachers had been reported challenging. There must be an institute provided support system to facilitate teachers to increase the benefits from educational technologies. In most cases, the curriculum or teaching learning activity or assessment would require change to ensure the alignment of course objective and technology adoption. Rogers detailed two diffusion processes, firstly for individual's decision making process [13, p. 163] and secondly for organizations innovations process [13, p. 392]. The proposed EPR is a combination of BPR and Rogers' innovations process for organizations [13, pp. 371-404] in the phase 6 of EPR diffusion communication process for individuals or users begin.

5. Future Work

The proposed EPR process or methodologies is a result of the authors' finding on significantly low teaching-learning use of two web-based educational technologies for blended learning, provided and maintained by a university's dedicated elearning deployment section. Educational software selection and deployment had not been based on teaching-learning process improvement scopes, sufficient training for users, continuous support and diffusion communication strategy. One department from each of the faculty of social sciences and humanities are selected for a case study, as the departments have autonomous decision making ability. The case study is expected to enlighten the authors to elaborate the EPR and diffusion strategies to develop a generic framework. The case is in a developed country of Europe. A second case study is in progress in connection with a rural secondary and higher secondary educational institute of a developing country [8]. The case has selected four subjects of four classes as part of national public-private-partnership project in Bangladesh and would attempt to generalize the EPR towards the framework outcome.

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