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E-LEARNING INSTRUCTION GENERATION APPROACH IN TERMS OF EXPERIENCE ECONOMY

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ABSTRACT

With the trend of service innovation and experience economy, innovative services with mass customization is the right way to shift into the Experience Economy. Nowadays, E-Learning services development is limited and digital learning material inadequate is one of the most important issues in this area. By taking rapid instruction prototyping into consideration and implementing the modular architecture that offer mass customization services and rapid, then the E-Learning in terms of Experience Economy will realize rapidly. This study proposes an innovative service concept with efficiently offering reusable learning assets for accelerating learning material development. The innovative approach of E-Learning instruction generation services is illustrated and the conceptual model of proposed service framework is outlined. The major findings of this study are: E-Learning instruction generation model for effectively utilizing course contents in Web 2.0 website; conceptual model for dynamic componentization of learning assets. Finally, discussion direction for further research is proposed.

Keywords: E-Learning, Web2.0, learning assets, mass customization, experience economy

INTRODUCTION

The service sector is currently the main contributor to the economy in many developing or developed countries. In American, it employs 82.1 percent of the U. S. workforce and 69 percent of graduates from technological university. Service sector growth is limited despite its economic importance because of the Baumol effect and other factors [9]. Consequently, the innovation and development of service sectors are very important.

Consumer experience greatly contribute to service innovation with three aspects [3] : increasing the values between consumers and service providers, improving life of consumers and service providers by new service solution, and establishing good reputation of company by service innovation. To development a new service should consider the experience of consumer as early as possible. With the trend of service and experience economy, experienced services accelerate experience economy development rapidly.

To shift into the Experience Economy, Mass customizing services offers a great way [4]. When someone purchases an experience, he will get memorable events in a personal way, and this differs from buying goods and services. However, how does service providers offer personalized service to thousands of consumers? Mass customization offers the solution– producing standardized modules that combine in different ways for different buyers, like Lego building blocks. Mass Customization offers an effective way to create unique customer experiences. A set of modules and a linkage system are two basic elements for mass customizing your services [4]. To define the modular architecture that equips a company to offer mass customization services, then the Experience Economy will realize rapidly.

Education service is among the most growth service sector according to a service research report [21]. With the trend of information technology application, E-Learning service develops rapidly. Many countries set up E-Learning programs to level up national competitive capability in Economical Era. However, the goal of learning for all is limited because of low production of digital materials. (1)Most developments and discussions in E-Learning focus on the integration and improvement of LMS (Learning Management System) in different architectures. There already existed many SCORM compatible learning platforms, such as CyberLink's CTMS (CyberLink Training Management System) and ADL's Sample Run-Time Environment. However, most commercial software claimed to support E-Learning development not only cost much but also took time to familiar with operation interface, the quantity and quality of learning material outputs still fell behind and were hard to achieve the goal of learning for everybody. (2)Besides, learning courses must follow international standards in many national plans, such as NPLP in Taiwan, especially the SCORM model recommended by ADL (Advanced Distributed Learning) Initiative. The SCORM defined an xml file, called Manifest file, which contained four elements: Metadata, Organization, Resources and Manifest in SCORM standard. The most trivial and boring procedure in course production maybe is to connect Organizations and Resources element with course structures and physical files. This results in low productivity and needs to bring more focus on the challenge of learning courses shortage.

In conclusion, issues of material low production cause E-Learning services development are limited. However, innovative services with mass customization accelerate the Experience Economy coming. This study proposes an E-Learning instruction generation approach for realizing innovative services with mass customization. Therefore, E-Learning services development rapidly by such innovative E-Learning services. The objectives of this paper are as follows:

(1)To illustrate the innovative approach of E-Learning instruction generation services.

(2)To outline the conceptual model of proposed service framework and the connection with mass customization.

(3)To propose a service concept for accelerating E-Learning services development.

This study first performs an in-depth literature review to E-Learning and Instructional Design model, Web 2.0, service innovation, mass customization in the experience economy. Next, the approach of the E-Learning instruction generation for innovative services with mass customization is explored and link up the service conceptual model with mass customization. The final section summarizes the implications of this study and discusses directions for further research.

LITERATURE REVIEW

E-Learning and Instructional Design Model

Rosenberg defines E-Learning as a networked phenomenon allowing for instant revisions and distribution and it is delivered using standard Internet technology [20]. Though present learning websites and platforms claimed as E-Learning ready, they might face two primitive challenges. One is that learning resources were hard to integrate and interoperate; the other is learning effect was hard to evaluate. We believe that it will not be easy to solve these issues effectively without adapting international standards.

With a number of researches try to present their E-Learning practices to transfer the ideas of innovation, many initiatives try to propose their E-Learning specification to transfer the benefits of standardization as well. Among various kinds of standards, SCORM defines a model for packaging learning content to facilitate content delivery and might be the most widely accepted model of multimedia E-Learning today. The model has three main parts: the "Content Aggregation Model (CAM)", "Run-time Environment (RTE)" and "Sequencing and Navigation (SN)." In Content Aggregation Model, it defines the inclusion of metadata for describing the course content [5]. Fox example, filling <item> elements in <organization> sections with asset item references (item1, item2, item3 …) and fill <file> elements in <resources> sections with asset file locations (item1.html, item2.html, item3.html …). But it was considered too toilsome and laborious in this procedure without producing these mapping automatically or by related tools.

Instructional Design as a process is defined by Berger and Kam [2] as "the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction". It includes development and evaluation of instructional materials and activities. Various models for such a systematic design have been proposed, but ADDIE maybe is a commonly used approach. It is an acronym referring to the five major processes. The Analysis phase is the process of defining what is to be learned and is the foundation for all the other phases of instructional design. The Design phase is the process of specifying how it is to be learned. This phase is to plan a strategy for developing the instruction and to outline how to reach the instructional goals. The Development phase is the process of authoring and producing the materials. This phase is to generate the lesson plans and lesson materials. The Implementation phase is the process of installing the project in the real world context. The Evaluation phase is the process of determining the adequacy of the instruction. This phase measures the effectiveness and efficiency of the instruction. The above processes could be sequential and iterative, as depicted in Figure 1 [15].

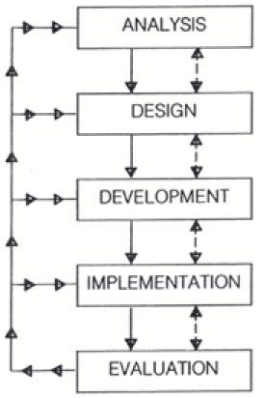

Fig. 1. An instructional systems development model featuring the ADDIE processes

Given the similarities between software design and instructional design, some researches argue that rapid prototyping is a viable model for instructional design, especially for computer-based instruction [13].

Web 2.0

Web 2.0 incorporated different service and technology and became distinct from traditional Internet and the breakthrough come from innovations in business model, communication and organization. O'Reilly formulated the paradigm shift of Web 2.0 and concluded the important slogan "Data is the Next Intel Inside" [17]. Among all the phenomena, the E-Learning course production can benefit from several episodes to improve productivity. Fist is the way of data integration changed from screen scraping to web services. Second is the way information organization evolved from directories (taxonomy) to tagging (folksonomy). Third is the information can be aggregated in syndication rather then stickiness.

Web service, as defined by the W3C Web Services Architecture Working Group, was "a software system identified by a URI, whose public interfaces and bindings are defined and described using XML". It also should be "services" similar to those in

conventional middleware. Not only they should be "up and running", but they should be described and advertised so that it was possible to write clients that bound and interacted with them [1]. In other words, Web services were components that could be integrated into more complex distributed applications.

Folksonomy was a way of user generated, involved and guided to organize information and its particularity is open, sharable and dynamic refresh [10]. Free meant anyone could use customized tags to categorize web contents they interested. Sharable meant users could discover related resources by a given tag instantly and see other tags that this person shared. Through the creation and usage of different tags to make up and retrieve web resource, some tags would fade in and some would fade out. This dynamic refresh often point out hot spots and interesting trends of applications. Moreover, many websites or "blogs" constitute various learning contents which can be accessed and aggregated by means of tagging and syndication. For example, much radio news are managed and played using MP3 files and Rich Site Summary (RSS) for updates and distribution in efficient way through the Internet.

Service Innovation and Experience Economy

Comparative economic studies indicate that the service sector is now the driving force of economic growth in every developed economy [22]. By 2004, the service sector comprised 68.7% of GDP while manufacturing had fallen to 29.6%. Due to the Baumol effect and other factors, service sector growth is limited despite its economic importance [9].

Gallouj (1997) [7] mentioned service characteristic, properties of service activities ("fuzzy" nature of their output, difficult to measure them by the traditional economic methods and to detect improvement or change). Following on from Hill (1977), has helped to bring into general use the definition of a service as a set of processing operation (…) carried out by a service provider (B) on behalf of a client (A), in a medium (C) held by A, and intended to bring about a change of state in the medium C.

The importance of service innovation pushes research institutes and companies to discuss subjects such as service engineering, service management, and service science from the perspective of service innovation. According to many researchers, service can be characterized as intangible, simultaneous and heterogeneous [12]. The emerging information technology services are unique in four aspects: they are information-driven, customer-centric, e-oriented and productivity-focused [9]. SerHertog proposed in 1999 a four-dimensional-model of service innovation for explaining and analyzing service innovations [18]. The four proposed dimensions were new service concept, new client interface, technological option and new service delivery system.

Consumer experience greatly contribute to service innovation with three aspects [3]: increasing the values between consumers and service providers, improving life of consumers and service providers by new service solution, and establishing good reputation of company by service innovation. The design of innovative services requires careful consideration of the overall experience of users, including past experience and experience using the new service [14]. A useful method of service innovation is "experience prototyping" [14]. In this approach, the initial process of developing service innovation is finding the key service user and using a pilot system to study his or her feelings towards the new service to ensure a successfully designed service innovation.

The Experience Economy is inevitable as the trend of social development. The production pattern of experience economy is mass customization based on the user involvement [23]. To surpass competitors in the Experience Economy, Mass customization is the right way [3]. Mass customization offers customer customization and personalization of products and services for individual at a mass production price. Customization and low cost cannot achieve simultaneously. However, the core of mass production is to provide low cost but personalize service [23]. Further, to create a memorable experience to the consumers. Mass customization produce uniformed modules that combine in different ways for different buyers. This way is like Lego building blocks. Two basic elements of mass customization are a set of modules and a linkage system that dynamically connects them. To define the modular architecture equips a company to offer mass customization services. [4]

E-LEARNING INSTRUCTION GENERATION APPROACH

E-Learning Instruction Generation Model

Kandil, El-Bialy and Wahba once proposed a system for massive course generation [11]. They used a prepared script of the course and its organization to produce hierarchical structure of chapters that includes pages. The instructor needs to describe its contents in terms of multimedia components, such as text, sound, image, and video. Its implementation lack of flexibility and proprietary output format was hard to reused and share.

With further analysis environments of Web 2.0, it was easy to discovery that learning material resources already existed, but appeared in incompatible, inconsistent or distributed forms and needed to transform and customize to suit international learning standards. Procedures followed to make proprietary contents exportable to open standard were remarked on E-Learning standard website (e.g., ADL), and many experiments also proved the feasibility of learning contents transformation, such as SGML documents [24] and DICOM (Digital Imaging and Communications in Medicine) medical images [25].

There is no doubt that much information and knowledge can be exploited from WWW (World-Wide Web) under the new trends of information sharing and collaborative development. In this way, the logistic of E-Learning industry must take WWW as a single platform to access and integrate different information in global view.

By taking improvement in software development for reference, such as component model and rapid Prototyping, many researches seek to transfer the ideas and benefits of the reusable concept to the development and delivery of educational instructions. Reusable learning assets is an innovative paradigm shift in instruction generation that promises to bring to education the same improvements in productivity that it has in software development [6]. With integrating ADDIE model and rapid prototyping to meet the need of mass customization, we proposed E-Learning instruction generation approach in terns of

experience service illustrated in Figure 2 and the components listed as following.

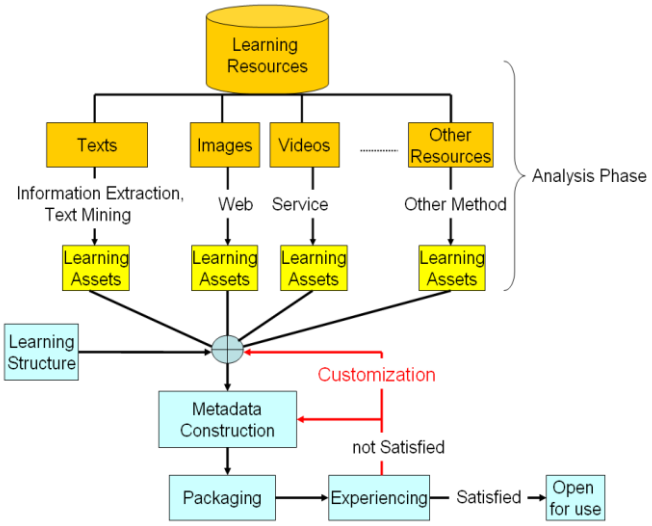

Fig. 2. E-Learning instruction generation model

The proposed approach can be separated into five procedures and introduced as follows :

(1)From learning resources to Assets: In this phase, the learning resources are identified. Assets are learning content in its most basic form and can be text, images, videos, or other digital resources. The text can be analyzed and prepared in advance separately according to transformation, Information Extraction or Text Mining. Besides, through advanced way of data integration and information organization, images and videos can be taken as learning assets by Web services interface. By means of tagging and syndication, many websites, such as Flickr, wikipedia, open text archives, etc., can be accessed and aggregated. Then packaging into SCORM-compliant learning assets is to form other procedure's basis.

(2)Define Learning Structure: Learning objectives, contents, lesson planning and media selection are decided and the learning structure is defined in this procedure.

(3)Metadata Construction: SCORM requires the inclusion of metadata for describing the course content. This procedure deals with metadata construction automatically and such arrangement facilitates users of E-Learning systems to be able to identify appropriate course materials in an efficient and effective way. SCORM 2004 example on ADL's website was a good template to carry on, and it is easy to modify this Manifest file if the evaluation of package is not satisfied.

(4)Packaging: During this procedure, a learning packing including the related learning resources and metadata is generated. By packing all files in RFC1951 format, the output can conform to SCORM standard.

(5)Experiencing: We take experiencing instead of evaluation in this procedure, and importing courses into Learning Management System (LMS) in order to present the generated instruction. With trying out and reviewing online, it is easy to check if the results meet our demand. Go back to procedure of learning structure definition or metadata construction and rebuild the instruction again.

Conceptual Model of Proposed Service Framework

The proposed innovative mechanisms of learning instruction generation service can be outline as the following conceptual model illustrated in Figure 3.

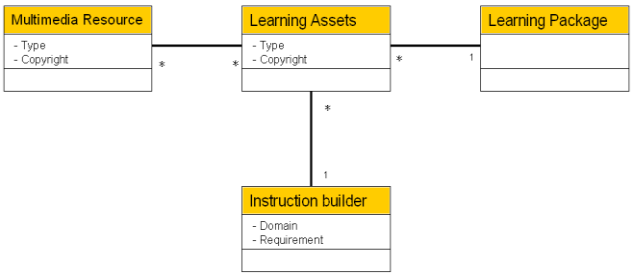

Fig. 3. E-Learning instruction generation

The growth of the Internet, service automation, globalization and the dynamic componentization of learning assets are driving the reconfiguration of instruction generation networks at a scale and pace never before seen in history. By following this innovative service, productivity can be improve with lower down the cost of courses generation and allow the instructors to concentrate on his tasks. The goal of mass customization can also have been achieved as well.

CONCLUSIONS AND RESEARCH DIRECTION

With the trend of service innovation and experience economy, this study points out issues of low material productivity and defines the modular architecture that equips an innovative service to offer mass customization. An approach of E-Learning instruction generation is proposed as well for addressing material inadequate issues. Promoting innovative services with mass customization in E-Learning service sector speeds up E-Learning services development and Experience Economy realizing.

Reusable learning assets is an emerging paradigm shift in instructional systems and course building need to start thinking in terms of learning objects. We proposed a framework of wrapping various multimedia resources as learning assets and course builders can reuse and combine them depending on different teaching strategy and objective. It not only offers more flexible but also meets the concept of share and reuse. Besides, we take advantage of prepared programs to complete the manifest file conform to SCORM specification automatically for saving time and lowering cost in course building. At last, this framework takes rapid prototyping into consideration and experience outputs on LMS instantly. In conclusion, there has been enormous increase in course production productivity through our proposed framework.

Moreover, the right combination of reusable software components in an SOA can provide each individual with a customized software experience. Researches also claim that learning assets repository could help save time and cost while avoiding the repeated rebuilding from scratch of similar instructions [16]. We can summarize and store different heterogeneous learning assets in storage to improve the value of our proposed model and make the core value of experience service to appreciate continuously.

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