Components of Network Servers towards Improving the Effectiveness of E-learning Environment

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ABSTRACT

E-learning is the delivery of a learning, training or education program by electronic means. E-learning involves the use of a computer or electronic device (e.g. a mobile phone) in some way to provide training, educational or learning material (Stockly, 2005). Looking at today’s world, the word “e” that stands for electronic has taken over so many aspects of people’s live, hence the importance of e-learning cannot be denied any longer. To be able to implement effective e-learning environment, one of the vital requirements in the whole process is a network server. This paper is a concept paper, which discusses the components of the network server. The idea of this concept was born from an informal observation of Universiti Utara Malaysia’s (UUM) e-learning application environment, LearningCare. Based on the observation, five potential components have been identified. They are courseware template, tools to simplify a development of new courseware, tools for administrations and security purpose, features for interactivity and collaboration, and facilities for adaptation to diversity level of users and learning paradigm. These components will be elaborated in details later in this paper. To set up an effective e-learning environment is very complex considering sixty four variables under five different clusters it affects (Dillon, 2004) and hopefully with the introduction of the five components, the effectiveness of one of the variable can be increased which is the learning environment variable.

Keywords: E-learning, multimedia educational network, potential components of e-learning servers.
1.0 Introduction
During plenty of previous years, knowledge was known to be taught and gained at schools, institutions, universities and any place that offers knowledge. Learners and educators have to be in one place, one location, one room, and at one range of time. However, nowadays with the emergence of multimedia networking, there is more than one method to gain knowledge and it gives more flexibility and advantages compared to the traditional method. It is what people in this era called e-learning which firmly stands for electronic learning. According to Ehrlich (2002), e-learning covers a wide set of applications and processes such as web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet, audio and videotape, satellite, and CD-ROM.

This method of learning offers several advantages to learner over the traditional one (Cavusgil et al., 2002). Among them is on-demand availability that enables students to complete training conveniently at off-hours or from home without having to travel to and fro to any location. Secondly, learners can learn at their own pace without facing any stress but still being able to gain satisfaction of learning. With the addition of interactivity element, learners will be pushed to involve in the whole learning process rather than being pulled all the way. Beside that, they can always refer to material refreshers provided incase they have forgotten certain important points of knowledge at certain point of time without having to be burdened by the responsibility of mastery.

Nevertheless, not all e-learning environments are effective. Environments that are effective must be equipped with correct self and technical requirements for it to be so. Should it be equipped with the wrong requirements, it will only dissolve the whole learning process to a disaster by becoming one ineffective learning method. This paper will concentrate on discussion of technical requirements needed for educators and learners to be engaged in an effective e-learning environment. There are quite a few technical requirements that need to be fulfilled by educator and learner such as operating system, media player, web browser, Internet connection, and a computer, not to mention all (Tuttle, 2005). However, the most important requirement is a server in a network that hosts the e-learning environment. Questions such as what should be installed in the server, what facilities should be offered by it, how should it handles the whole knowledge transactions, and other similar questions should be asked in order for the learning process to be effective. The server should be acting like an intelligent hub with less human interference so that the meaning reflected by e-learning will be at least made use which is a learning, training or education program by electronic means (Stockly, 2005).

To answer questions that possibly be imposed regarding the server, five potential components have been identified in order for the server to host one effective learning environment. They are courseware template, tools to simplify a development of new courseware, tools for administrations and security purpose, features for interactivity and collaboration, and facilities for an adaptation to diversity levels of learners and learning paradigm. The following contents will discuss about each of the components conceptually.
2.0 Courseware Template

As defined by Zelmer (1996), courseware is computer-based educational materials, a category of application software, which is a cross between program and data. Courseware includes didactic teaching materials, educational games, and interactive multimedia. Since the beginning of the introduction of multimedia, courseware has been popular in either offline or online learning domain. In offline learning domain, which is the traditional way, courseware exists as a standalone application. It is distributed in a compact disc format. Moreover, for each educational subject, a courseware must be developed individually which means that if there were six subjects, hence six individual coursewares were needed. This is considered as ineffective since courseware development is costly. Instead of developing many coursewares, it is more effective to develop only single courseware be it in web-based or application based and resides it in a central server to be retrieved by different learners in different locations using Internet facilities.

However, this single courseware must be developed as a template courseware. Template is a page designed by a particular tool and designate certain portions of the page as editable and it is created by developers and designers (Towers, 2001). It means that by creating one courseware design for a particular subject, the same design can be used to produce new courseware for other subjects. Contents for courseware are placed in placeholders by authorized author and subject matter expert. Only the contents in the placeholders of the courseware need to be altered in order to distinguish the contents of each courseware carry for different subjects. Nevertheless, as defined by Towers (2001), to create a template, a particular tool is necessary in the first hand. Currently, there are several tools intended and available for courseware implementation and these same tools are useable in creating the template (Ochoa et al., 2002).

3.0 Tools To Simplify a Development of New Courseware

Simplification of new courseware development is closely tied to initial cost involved in e-learning environment. This factor leads to another crucial factor involved in e-learning environment, which is the time required by programmers, instructional designers, authors, and subject matter experts to develop a courseware (Lee, 2003). These people play an important role in deciding the success or failure of any e-learning implementation. Ideally, they can cut coursewares production time by using or creating a template that captures concepts, design, and necessities of subjects taught in the given e-learning curriculum. To be able to manipulate template for a rapid courseware development, a particular authoring tool in subject matter is needed. The tool must be able to leverage instructional design, production and testing resources towards the delivery of more and better online course material for learners.

There are many authoring tools available in present market that can be utilized to create a template for a courseware such as Norpath Elements, iPerform, ToolBook, Macromedia Flash, Macromedia Authorware, and Macromedia Dreamweaver to name a few. However, it is not an intention of this paper to elaborate the transcendence of one tool over another for it will be an infinite discussion since there are too many tools available and each one offers unique features over another. These tools are supplied with features
that enable template creation automatically and easily like Macromedia Dreamweaver and Microsoft Power Point to name the basic ones (Pilgrim et al., 1997). As stated by Grutzner et al., (2002), existing authoring support tools provide easy access to templates including templates to produce pages or tests, wizards to create courses that provide easy access to templates, facility to implement instructional structure templates and navigational templates and guidelines for their application. With the access to templates features, the task to produce different kind of courseware with different contents becomes much easier. Changes that need to be inflicted to an interface will be minimal as stated in point 2.0 above.

No matter which tool is chosen, once the decision is made, the main challenge is to develop a design general enough to provide flexibility required by designers and parallely, specific enough to provide the desired leverage and production efficiency. In pertain to the challenge stated; a well-designed template can become an extremely valuable asset that contributes not only to reducing production costs, but also to improving the quality of the courseware produce. With the template design, the task to produce coursewares will not be daunting anymore since it lifted up the burden to start the development from scratch. In spite of that, an e-learning environment is not much effective without a good administration and its tools, and tight security against hackers and knowledge intruders.

4.0 Tools For Administrations And Security Purpose
Generally, administration is the act or process of administering, especially the management of a government or large institution (Dictionary.com, 2005). In e-learning context, the same terminology relates to the use of ICT tools and e-learning technologies to support the management and administration of a programme or module (Pheples and Papaefthimiou, 2003). Nowadays, new e-learning technologies keep giving birth to better administration tools, which contribute in improving the effectiveness of the environment particularly in facilitating a communication among learners and education providers be it lecturers, tutors or the institutions themselves. There are quite remarkable amounts of tools or software packages or anything they have been called out there in the growing Information Technology and Multimedia world that can be utilized in administrating an e-learning environment. Among particular tools developed by particular companies that claims to bestow administration functionality over an e-learning environment are E-learning Resource Management System (EMS), Interactive Intelligence-Education Services (II-ES), DigitalThink Learning Management System and Catalyst Interactive LearnSwitch to name a few. Regardless of any tools mentioned or not, they must be able to perform the least basic functionalities of e-learning environment administration such as timetable information, programme and module information, course approval and activation, course availability administration, instructor assignment, course instructor replacement, content management and user authentication function.

User authentication function is the process of reliably determining the identity of a communicating party (Kaufman et al., 2002). It manages and filters users that try to gain access to a system, hence secures the system. This process is like a two edge sword in vicarious learning in a distributed environment. It conveys the fact that administration
aspect must walks along with security aspect in order to preserve a manageable and safe learning domain. Authentication is one of many other functions offered by e-learning tools in effort of confirming the accuracy and authenticity of users and battle towards intrusion and any illegal acts performed by irresponsible individuals (Zaidel, 2002). Most of the tools developed for administration purposes has been built-in with authentication capability such as EMS and II-ES, hence they performs two tasks in a phase, which is to administer and to secure. For instance, II-ES includes a package of IC Basic Administration, Interaction Attendant, Troubleshooting the IC Platform and IC System Administration. This package contains four functions and two of them relate to security and administration of an e-learning system, which are IC Basic Administration, and IC System Administration. IC Basic Administration performs daily basis tasks such as creating and modifying the default user permission to access a system, users’ workgroups and schedules. Administrator for this function must stay close to end-users in order to provide technical support in case of complication arise. Meanwhile, IC System Administration focuses more on higher level and complicated tasks such as describing the data logging process and Interaction Center Security Model, and configuring the default user permission. Administrator responsible for this function must stay close to daily basis administrator and act as a contact to e-learning software provider in case of security issues occur.

However, sadly to say, user authentication along with other security and administration functions offered by tools mentioned above is just not enough in order to maintain adequate security provisions over an e-learning environment. A third party software system is necessary to be implemented. Firewall system is a good software example that typically been used by organization. It is an intermediate system that provides indirect connection of server to an Internet (Halsall, 2001). There are plenty of tools that have firewall capabilities such as Black Ice Defender and Lockdown 2000. Both of these given instances of firewall system provide security provision in a user friendly way. Normally, as the saying that goes “Prevention is better than cure”, firewall system formulates a function to protect a network from hostile attack by acting as a filter that may pass, reject or simply drop a network traffic passes through a system (Angaye, 1995). Installed in a centralized e-learning server along with functions offered by administration tool, it is not guaranteed in entirety that an e-learning environment will be very safe since there is no system or tool that can offer that. Someway somehow, there exist loopholes that become the points of the system undoing. Nevertheless, by taking such safety precautious steps, the least the system can be is a level higher secure than leaving it open wide without any effort to protect it. As e-learning offers education to learners careless of their location, background and self-attributes, tools for administration and security become much more crucial and needed. Beside such tools, in effort to build a sense of learning environment in distant learners, features for interactivity and collaboration should be made one of the significant components of every e-learning environment.
5.0 Features For Interactivity And Collaboration

Interactivity and collaboration are two components that are inseparable from e-learning environment. Without these two, e-learning will be an incomplete learning environment or to be plain, there will be no room for two way communication between educators and learners. Be it no interactivity and collaboration, learners will not capable in giving any kind of feedback regarding subjects that they are learning, expressing their point of view and neither in confirming their understanding. In addition, educator will be handicapped in the context of knowing their students perspective relevant to the subjects matter, hence missing out in receiving inputs that maybe useful in improving their way of knowledge dissemination and attracting attention. Interactivity is the means by which a user is engaged with the content of a course, typically used as a tool to ensure learning meanwhile collaboration is people working together online over time (Marriott Conference Centers, 2005). Based on the given definitions, it is obvious that each component is dependent on one another, which means one cannot exist without the other. If two parties were to collaborate, then they have to interact, hence interactivity component comes into the picture and on the other hand, if they were interacting on particular reason, it is clearly that they were collaborating in order to achieve a similar goal.

It is understood that interactivity and collaboration is possible to be accomplished in two modes (Shapiro, 1996). The first mode is done in real time while the second one allows interaction and collaboration to be done at individuals own time and later on pull up all the efforts together. Alternatively, they are also called synchronous and asynchronous modes of communication. According to Vat (2001), synchronous communication means a face-to-face meeting between educators and learners, with all the participants being present, either at the same physical location or at different sites through invented technologies. This type of communication environment must consider heavily on learners pace of learning. Educators must pose as facilitators to assist learners since learners’ potential in building their own initiative to study has been restricted. Even though this type of communication does not provide flexibility of learning and somewhat restricting learners’ sense of effort to study, it does succeed in establishing the sense of immediacy, interactivity, and shared purpose as the consequence of face-to-face meetings. There are tools that facilitate in such approach of communication. Generally, as stated by Baeker (2003), audio/web conferencing and multipoint videoconferencing are two methods quintessentially used for real-time communication, collaboration, and knowledge sharing over the Internet. Tools like NetMeeting, AOL IM, MSN Messenger, IRC, ICQ, and Yahoo Messenger are some instances, which some of them are freeware and the other can be owned with some amount of payment (Costagliola, 2004).

In spite of real time, as stated by Vat (2001), asynchronous communication is not dependent upon educators and learners being present together at a specific time or location in order for learning process to be conducted, though it is mediated by technological tools. As opposed to synchronous communication, asynchronous communication empowers learners to learn in their own time and pace, where and when they feel fit to study. With the duration of time given, learners are able to converse with others comfortably pertaining to their study, hence encourages cooperation and
discussion among them. Since it allows learners to learn without time constrain, pace of learning and instruction are no longer pose as issues. There exist a range of tools that facilitates asynchronous communication which available to learners and educators. These tools are either free to be used with some conditions applied or they can be used with some remuneration. As an epitome of such tools, there are emails, newsgroups, mailing lists, threaded discussions, and organizational memories. Despite the lack of real-time functionalities, these epitomes of asynchronous communication tools provide learners with a collaborative workspace for them to share ideas and files over duration of time giving them flexibility in learning as constrast to synchronous communication mode.

Regardless of any modes opted for, e-learning still has to face bigger and more abstract components which are existence of various level of learners and their learning paradigm. These two components are interrelated too. In realization to various level of learners committed to e-learning, there has to be particular methods in tackling them since each learner has a distinguish paradigm of learning. In sequence to gain a better and more effective learning environment, study on these two components must be emphasized in order to seek for proper adaptation facilities.

6.0 Facilities for an Adaptation to Diversity Levels Of Learners and Learning Paradigm
In traditional method of learning, educators face predicament in handling learners in certain ways. One of them is the difficulty to cope with the diversity level of learners in a classroom, which leads to diversity in learning style. As pointed out by Pivec (2004), from the didactical point of view there are numerous approaches to learning, such as learning by observation, learning by enquiry and investigation, learning by doing, individually, face-to-face and in groups, experimental learning, learning by evaluation and reflection. This difficulty makes educators keen to implement the current paradigm that lifted burden from their shoulders, which is the instruction paradigm. According to the instruction paradigm, educators are the locus of control in a classroom, which means that the authority to decide contents, standards, method of learning, and procedure of evaluation is in their hands. This is apparently unfair and confusing to learners. The instruction paradigm assumes that learners learn in a same way and at a same rate. Obviously, this is a fallacy since learners are originated from diverse background and with various mental rates that result in different pace of study. Assuming that they possess equal learning way and rate may lead to their failure. In e-learning environment, this matter is much more critical since the level of diversity of its learners is much higher in percentage considering its borderlessness. Learners could possibly be elders, disadvantaged groups, or gifted ones. This is the time to shift from the instruction paradigm to learning paradigm. As opposed to instruction paradigm, learning paradigm assumes that learners learn differently and at a different rate. It also assumes that learners have chance to be succeed provided that they are supplied with personal motivation, adequate time, and appropriate learning activities and support. This is aimed to produce learning instead of just providing instructions to learners (Tagg, 1995). Regarding e-learning environment, it is essential to provide proper facilities in order to adapt to the diversity of learners according to learning paradigm. Moreover, learning paradigm is
empowered by technology and it aligns readily with technology-driven learning system, which is e-learning.

As pointed out by Lee et al., (2003), the process of adaptation to diversity of levels of learners and learning paradigm is often known as adaptive learning. Hence the name, adaptive system is required to be able to adapt to various learners and their learning paradigm. Emerging today in the fields of adaptive system to accommodate adaptive learning in e-learning environment is adaptive hypermedia system (AHS). Generally, AHS endeavours to improve learning process by providing solution to the problem of disorientation and the necessity to put up with diversity of learners by being capable of searching for and filtering out the information most pertinent to the learners’ needs, goals, and interests. By adapting the presented information to the current knowledge level of the learners, automatically it will guide them to the right path of learning without misleading and confusing them with knowledge unnecessary to their level of thinking. As stated by Hockemeyer (1997), one of the focal features of AHS is the adaptation ability based on learners’ preferences and the knowledge level of the learners. Based on learners’ characteristic such as age, language, geographical location, current level of thinking and learning, AHS can try its best to adapt to the learners’ need, thus giving the opportunity for them to learn comfortably at their own pace of scheme.

Evidently, there are systems developed by e-learning researchers that equipped with AHS functionalities, more or less to say. Two of the epitomes are Personal Learning Assistant (PLA) under ELENA Project (Dolog et al., 2004) and Collaborative and Sharable Learning (COSL) system (Lee et al., 2003). As still in progress, PLA amalgamates personalization services and other supporting services, and provides the personalized access to learning resources in an e-learning network. The services offered by PLA are Personal Learning Assistant and User Interaction Components, personalization, and supporting, not to mention sub-services under each service mentioned. Each service collaborates in order to achieve adaptive functionalities. Meanwhile, COSL system is a learning middleware suite built to develop e-learning systems and course materials for the environment. Given that learners are dispersed in different location geographically, COSL system emphasizes on fast real-time communication system among educators and learners. Furthermore, not forgetting adaptive functionality it also allows building and managing of global real-time learning systems in a distributed and heterogeneous environment. Likewise to PLA, COSL system as a core infrastructure consists of several components in order ensures the effectiveness in distributed learning. Those components are Learning Component Systems (LCSs), Learning Channel, and Learning Middleware. Each component has contents, activities, rules, constraints, and operations to deal with extension or modification of generic learning patterns (Lee et al., 2003).

7.0 Conclusion
In this paper, five important components of e-learning network server have been identified and elaborated. They are courseware template, tools to simplify a development of new courseware, tools for administrations and security purpose, features for interactivity and collaboration, and facilities for an adaptation to diversity levels of learners and learning paradigm in order. Their contribution towards the effectiveness in
e-learning environment is significance. Each of them play specific role individually but one component cannot thrive alone in order to optimize the environment. All of them need to come together, to be united in one server with each component functioning based on its predetermined disposition.

These five components are not going to be five immobile components for eternity. In entirety, they formed a good team in the much gaining popularity of e-learning environment. Nevertheless, many researches have been done in order to improve the effectiveness of e-learning environment. Thus, they are going to be many more valuable and useful components identified and with a collaboration of the future components and the five components, it is wise to say that e-learning environment will become much more effective and a formidable means of conveying knowledge in this century.

References


