The Design and Development of an Open and Flexible E-Training System for the Creation of Learning Organizations

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Abstract
In the rapid development of global market, there is an urgent need for organization to provide training to its employees to ensure their continuous competence in handling their task. The challenge from this scenario is to find a way to enforce employees to enhance their knowledge and skills from time to time by developing an e-training system. Applying the learning organization model through the e-training system would indirectly introduce the learning organization concept into the organization. Apart from e-training, knowledge management system was also implemented to ensure the effectiveness of learning organization. This research is about the design and development of an e-training system using University of Malaya (UM) as the case study. The system would offer Balanced Scorecard (BSC) and Technopreneurship as the sample courses. The discussion scope of this paper is limited to the development of the system framework and architecture which form the initial stage of this research work. Based on the findings, it is shown that e-training system can be used as a tool to create learning organizations in companies and educational institutions.

Keywords: E-Training, Balanced Scorecard (BSC), Technopreneurship, Knowledge Management

1.0 Introduction
E-training has shown its ability to bring greater good to modern corporations in building their staff competency development. Hewlett-Packard had an arrangement with Microsoft and had to retrain 3,000 workers. By using e-training, instead of taking 3 months to achieve the goal, it had taken them eight weeks and saved them $10 million (Overman 2004). Rockwell Collins decreased 40 percent of their training expenditure when they converted only 25 percent of their training contents and make the training available via online (Strother 2002).

Educational organizations such as the higher learning institutions (i.e. universities and colleges) are no exceptions as they also need to constantly keep up with the demanding job prospect to produce high quality employees. In order to meet this challenge, the academic staff of such educational organization has to attend training programs to ensure the continual updating of skills and competencies (Lorange 1996). Competencies come in many forms such as behavioral competency and technical competency. The different level of expertise and experience between staff add to the complexity of developing training programs. Since e-training focuses on structured training (Anohina 2005), this aspect has to be taken into consideration when developing the system. Apart from that, there are many other aspects that needed to be considered by organizations when managing training programs for their staff. Not only they have to identify gaps of the skill among staff, they also need to plan the training schedule and consider the possibility of having an in-house training or outside training. In addition, it is not easy to manage the remaining resources in the office when many staff are sent for training at any one time. The cost of trainings provided by external trainers is also increasing from day to day. By having training materials accessible online, employees are able to sit at the office or at home to partake in the training. In other word, they do not need to specify the exact time or place in order to do the training.
Learning organization offered the justification of developing e-training and supported the need for continual upgrading of skills and knowledge (Armstrong and Foley 2003). In this research, learning organization will act as the base factor in developing the e-training system.

The deliverables of this research at this initial stage include the development of the system framework and system architecture of the e-training system. The solution would incorporate two courses, namely the Balanced Scorecard (BSC) and Technopreneurship as the sample course offerings. Once completed, this project can be customized and expanded to cater for the staff of Small-Medium Enterprises (SMEs) as a more liberate kind of training approach. It would allow SMEs in reducing their financial burden in sending their staff for costly personal and professional development and trainings.

2.0 Literature Review

The literature review focuses on the differences between e-learning and e-training; how learning organization concept can be used in developing the e-training system, and how e-training reflects on the concept of knowledge management.

2.1 E-Learning and E-Training

There is a distinctive difference between e-training and e-learning. E-training can also be referred to as web-based training. It consists of modularized training courses, available over the web, anytime of the day or night, anywhere the users have access to the Internet. The term ‘training’ assumes a planned and systematic sequence of activities usually under the guidance of qualified supervisors (Peterson 2007; Jarvis 1999), which has the purpose to develop knowledge, skills and behaviour pattern required by an individual in order to perform adequately and effectively. Thus, the term ‘training’ emphasizes the practical or vocational direction of the learning and typically is used on the professional or corporate level as Horton (1999) specifies. It is contrasting to the term ‘learning’ where it emphasizes a learner activity in the learning process, that is, a learner is free to choose what will be studied and in which sequence (Anohina 2005).

The “e” is the abbreviation of the word “electronic” and it implies on the process of learning through any electronic medium or environment. These media could include offline or connected to a network (Internet, Intranet, Extranet) computers, audio and video devices, satellite broadcasts, CD-ROM or DVD discs, interactive TV, phones, and etc (Kaplan-Leiserson 2000; World Wide Learn 2003). The e-training for this project suggest minimal handling of classroom-based interaction with the course facilitator and most of the time, training hours would be in a self-study mode. The course could be taken anytime, anywhere as long as users are equipped with either a laptop, PC or PDA with Internet connection.

2.2 E-Training and Learning Organization

The learning organization concept had been studied over the decades and most agreed that it is a culture that organizations should develop in this fast-changing and competitive environment (Hamel and Pralahad 1994). It is viewed as a process that needs effort in changing the behavior of the organization to institute practice, systems and structure to continue to learn how to learn (Sun and Scott 2003). It has also been generally accepted that learning is unquestionably a key determinant of corporate survival. Organizations rarely endure if they do not learn, but learning alone does not guarantee survival. Success in the organizations increasingly depends on learning, yet most people do not know how to learn (Argyris 1999).
A ten-pillar learning organizations model defined the ten elements that are crucial in order to make learning organizations work. E-training attempts at alleviating some of the obstacle when implementing learning organizations in a corporate or institutional setting. Furthermore, based on Sun and Scott (2003), learning organization is where learning takes place that moves an organization to a desired state. E-training can be seen as a tool to assist in achieving this objective.

From the ten-pillar, six of them can be addressed through the deployment of e-training. They are leaderships; communications; learning and development; intellectual capital and knowledge management; measurement and assessment; and reward and recognition. This model was derived from researchers and writers of learning organization, where they attempt to outline the ideal model of learning organization (Garvin 2000; Kotter 1999; Senge 1990):

a) **Leaderships.** It is to highlight that the institution vision is understood and shared at all levels and obstacles are to be removed where necessary. It is facilitative, coaching and concern for all members.

b) **Communications.** Sharing of ideas, knowledge and insights are the main points in this element.

c) **Learning and development.** Continuous and taking responsibility of one owns’ learning is crucial in this matter. The acquisition of knowledge has to be encouraged and provided for by the institution itself.

d) **Intellectual capital and knowledge management.** As new information and technology arrives, all employees should be encouraged to share the responsibility to add to the institution's intellectual capital. Tacit knowledge should be willingly and readily transferred.

e) **Measurement and assessment.** This is vital to show the changes in performance, behavior and commitment to continuous improvement. Analysis from the learning processes shall be used to plan for further training and assessment methods.

f) **Reward and recognition.** Individuals should be recognized and rewarded for their effort in order to provide the incentives to further improve performance and strengthen motivation. This will encouraged for future personal training by the employees.

The other four pillars are will; strategic thinking and vision; innovation and decision making and change management.

In higher educational system, three levels of organizations functions are involved in the training system and they are the Dean in the highest level or Level 1; the second level which is Head of Department; and the third level which is the lecturers themselves.

Figure 1 shows the learning organizations model in higher education institution setting. By adopting this e-training system for Higher Learning Institution, it will be a catalyst factor for UM to emerge as a learning organization. This will provide UM with a competitive advantage among other higher education institutions in Malaysia.
2.3 Learning Organization and Knowledge Management

Knowledge is the vital ingredient in the learning organization (Marquardt 1996). Employees need knowledge to increase their skills in improving products and services, which will also provide good quality service to clients and consumers. Knowledge is necessary to update products and services as well as to change systems and structures and to communicate solutions to problems. In short, knowledge is vital to enable organizations to grow. Individuals may come and go, but valuable knowledge cannot be lost or the company will not survive.

There are four types of knowledge subsystems and they include knowledge acquisition; knowledge creation; knowledge storage and knowledge transfer and utilization (Marquardt 1996). For organizations to learn effectively and efficiently, the process in the knowledge subsystem must be an ongoing and interactive process. Knowledge management (KM) requires both proactive and reactive mode. With KM becoming ever more important, organizations which have the ability to learn, or the ability to create and gain knowledge, will have a clear source of power (Denton 1998).

Figure 1: Learning Organization Implementation Model in E-Training System

In order to successfully implement KM in organization, it requires a strong culture of sharing information. The easiest way to implement this culture is by having an in-house training for employees. E-training is able to extend this concept further by providing an open and flexible platform for employees to access.

However, without a proper implementation system, it will be hard to sustain the learning culture. By having an e-training system with a systematic and flexible approach, the learning organization will evolve and strengthen over time (Vasilyena et al. 2005).

3.0 Methodology

The methodology used in this research was based on quantitative research method where survey is used as the research strategy. Data were gathered and collected using surveys questionnaires. Data are collected based on users’ experience and opinions towards online training.
3.1 Judgment Sampling Technique

The targeted users for the e-training system are the employees of the higher learning institution. For the purpose of this research, University of Malaya (UM) is picked to be the pilot institution. In this research, BSC and Technopreneurship are the two sample courses used for the research. These two subjects were chosen based on the assumption that most of the employees would want to use BSC to evaluate their balanced scorecard while Technopreneurship is an important subject to further implement any system. However, the system is built in such a way that other courses can be inserted later into the e-training system when needed. Three faculties are chosen to observe the requirements of and the response to the proposed system. A judgment sample of employees of these three faculties consisted of lecturers and they were selected for the survey for this research.

Unlike random sampling where given a population size, there is equal opportunity for any element in the population to be selected, judgment sampling is done using the discretion of the researcher. Judgment sampling sometimes called a non-probability sample or purposive sampling uses the researcher’s personal judgment in selecting the participants for the survey based on certain characteristics (Fraenkel and Wallen 1990). The basis for selecting judgment sampling over random sampling is to ensure accurate and representative information is gathered for the research area (Marshall 1996). With judgment sampling, the interpretation of the results will also be useful for the qualitative understanding of the issues studied. As stated by Deming (1996), ‘The usefulness of data from judgment-samples is judged by expert knowledge of the subject matter and comparisons with the results of previous surveys, not from the knowledge of probability’. Furthermore, it is typical and more practical for judgment sampling to be carried out to get an estimate of how receptive and feasible the research will be, as demonstrated by the research conducted by The Paul Coverdell Prototype Registries Writing Group (TPCRWG) in 2005 and Tuoghy (2003).

Instead of using a full-fetched probability survey, a trial survey would be adequate for pilot study due to the reason that a completely unbiased random sample may result in providing the responses that do not truly represent the target population (Kish et al. 2003). Thus, in this research, 20 respondents who are currently employees to the Faculty of Medicine, Faculty of Accounting and Business and Faculty of Computer Science and Information Technology, have taken part in this survey. Results are arranged in 3 sections which are respondents’ experience with e-training, respondents’ opinion on e-training, and discussion related to e-training.

4.0 Result and Data Analysis

Results from the questionnaires are gathered and displayed in forms of frequency and percentage shown in Figure 2. Mean (M) and standard deviation (SD) is used as the analysis technique shown is Table 1.
4.1 Experience with E-training

Figure 2 below showed the result of the frequency of respondents who had used e-training before. From the figure, it can be seen that a small number of them had experienced with e-training (15.0%) while the majority of them had none (85.0%). From this figure, it can be derived that e-training hasn’t been implemented to higher institutional staff.

![Figure 2: Respondents Experience with Business Related Training](image)

Table 1 below showed the result for respondents’ answers on the purposes of e-training. From the table, it can be seen that most respondents’ think that e-training assist in developing their career and studies in business skill (75.0%). Second highest opinion on purposes of e-training is to assist them to learn new things related to their career and studies (58.3%). While not receiving a high mean, 41.7% of respondents agreed that e-training served as part of fulfilling company’s and higher institution requirement.

<table>
<thead>
<tr>
<th>Purposes</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To develop business skills</td>
<td>9</td>
<td>75.00</td>
</tr>
<tr>
<td>in the career/studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. To learn new things</td>
<td>7</td>
<td>58.33</td>
</tr>
<tr>
<td>relating to the career/studies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. To fulfill the</td>
<td>5</td>
<td>41.67</td>
</tr>
<tr>
<td>company/institutes requirement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.2 Opinions on E-training

Table 2 below shows the result for respondents’ opinion on e-training. 11 tasks were listed out in the survey form and respondents were asked to grade them according to the most important and the least important to be included in the e-training system. Most important task carries a 10-point while least important task carries 1-point.
Table 2: Opinions on important task in an e-training system

<table>
<thead>
<tr>
<th>Task</th>
<th>Mean (M)</th>
<th>Standard Deviation (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ability to interact with other users through an online forum</td>
<td>7.45</td>
<td>2.01</td>
</tr>
<tr>
<td>2. Ability to provide lessons in how to write a business plan</td>
<td>7.45</td>
<td>2.56</td>
</tr>
<tr>
<td>3. Ability to check on status of learning performance at any time</td>
<td>7</td>
<td>2.55</td>
</tr>
<tr>
<td>4. Submit questions to administrator through email</td>
<td>6.8</td>
<td>2.26</td>
</tr>
<tr>
<td>5. Take exams securely through the Web</td>
<td>6.8</td>
<td>2.65</td>
</tr>
<tr>
<td>6. Ability to provide glossary</td>
<td>6.7</td>
<td>2.45</td>
</tr>
<tr>
<td>7. Browse course chapter by keyword</td>
<td>6.6</td>
<td>2.33</td>
</tr>
<tr>
<td>8. Ability to retake exams</td>
<td>6.55</td>
<td>2.74</td>
</tr>
<tr>
<td>9. Create learning profile</td>
<td>6.35</td>
<td>2.60</td>
</tr>
<tr>
<td>10. Ability to check on status of learning schedule at any time</td>
<td>6.2</td>
<td>2.89</td>
</tr>
<tr>
<td>11. Ability to provide business motivational quotes</td>
<td>5.7</td>
<td>2.49</td>
</tr>
</tbody>
</table>

Results in the Table 2 are arranged according to the most important tasks to the least important tasks. As can be seen from Table 2, the first two statements (statement 1 and statement 2) received a same score of 7.45. However, one way to determine which statement outranks the other is by studying the standard deviation. From the table, statement 1 received a lower SD than statement 2. This means that statement 1 is perceived as more important compared to statement 2. Most of the respondents have thus agreed that it is more important to include forums into e-training system to allow interaction between other users of the system than to provide lesson on how to write business plan.

Statement 3 received a score of 7 followed by statements 4 and statement 5 which received a same score of 6.8. Again, rank is determined by SD. Respondents agreed that system should allow user to submit questions to administrator as important compared to exams are to be taken securely through the Internet. The least important statement from this survey is statement 11 relating to business motivational quotes. The respondents give a score of 5.7. Following from the outcome of this survey is the construction of framework and system modules. In developing the framework for the system, the most important tasks are be given a higher priority than the less important tasks.
5.0 Discussions
The purpose of conducting the survey is to provide some insight on user requirement and other concerns pertaining the system before it is being developed. Some of the benefits of e-training that were outlined in the literature review was echoed during the survey where most of the respondents agreed that trainings that was done online are cost effective and flexible to access. This will ensure that the learning process is more convenient to suit users’ free time. However, a contradictory concern on this matter was issued by one of the respondent. He mentioned that it will be difficult for him to find time to access the e-training system due to heavy workload. There will be a lot of distraction online that will make it harder for users to commit fully into the learning process. This will consequently resulted in poorly conducted training process.

Another concern that was brought forth was the unavailable group works. Some of the respondents believe that there are some tasks that required group work. This will be made impossible when the training is conducted online. Users will not be able to interact with one another. However, based on the result in Table 2, it was discovered that most respondents agreed to the inclusion of forums in the e-training system. If forums were to be included, this will provide the medium for interaction among users.

All of these concerns can be narrowed down into one issue, and that is – communication. If the system is able to provide various ways for users to communicate among themselves and with the instructors, negative assumptions on implementation of the e-training system within an organizations can be minimized considerably.

6.0 The Design and Development of E-Training System
In the phase, system framework and system architecture were developed. System framework visualized the whole concept of the system by showing how the stakeholders, the technology used and the e-training system linked to each other. System architecture provides the conceptual design that defines the structure of the system.

6.1. E-Training System Framework
Figure 3 below shows the system framework based on findings of the data collection process. From this framework, it can be seen that there are two main users namely the learners which constitute the academic staff and the instructor which constitute the person responsible for the training program.

The key performance index (KPI) will be the pushing factor to both the learner and instructor to participate in the program. The learner will be the academic staff themselves while the instructor is someone who has extensive knowledge in the courses or the subject matter. By participating in e-training program such as this, it shows they have the initiative to improve themselves, and thus the reason to increase their KPI. On the other hand, the instructor who participates with the e-training system shows the willingness to share their knowledge and skills which correspond to the intellectual capital and knowledge management pillar from the model in Figure 3.

To emphasize the open and flexible concept in this e-training system, several access medium have been determined; at the workplace, at home and at any public places. Users may access the program through various devices. Since this e-training system is developed in web-based environment, the common devices would be the ubiquitous computer and laptop.
This research takes one step further by offering training through heterogeneous mobile clients such as personal digital assistant (PDA) and mobile phones. This mobility feature is to ensure the flexibility to meet the staff’s needs and their busy schedules. The course to be developed will incorporate the pedagogical aspects when delivering learning material such as catering for beginners to the course topic (i.e. basic concepts of BSC); catering for intermediate or advanced users and in providing assistance to the users using the e-training system.

Figure 3: UM In-House E-Training Program Framework

Learners are able to communicate with instructor through e-mail, phone and online forums. The highlight to this framework is the relation between e-training system and other components. In the early stage of development, the system will be developed to offer two courseware; namely the BSC courseware and the Technopreneurship courseware. KM components will be applied in the structure of the application where all of the concept of KM such as knowledge transfer, knowledge sharing, knowledge archiving and knowledge creation in incorporated to assist in managing users’ learning process. Eventually, the learning organization will be introduced and evolve over time.

6.2 E-Training System Architecture
Figure 4 illustrates the e-training system architecture. The system can be divided into three layers namely front-end layer, middle layer and back-end layer. These layers indicate the different level of communication between system elements.
6.2.1 Front-End Layer
This layer acts as the interface between the users and the system. Users do not have to concern themselves with the ongoing data transfer within the system. There are four modules offered in this system and they are ‘User Profile Module’, ‘Training Module’, ‘Forums’ and ‘Contact Instructor’.

User Profile Module consists of user details and user training history. This module displays the overview details of the staff’s utilization of the system. Here users are able to identify quickly their last interaction or activity within the system and resume right away. Training Module is the primary module as it is the central part of the system. Users performed their training in this module. Forum module provides the user with one of the means to contact the instructor or other users. Discussions on the training held within the system are conducted through this module. Contact Instructor hold the necessary information for the user to contact the instructor through phone, email or forums.

6.2.2 Middle Layer
This layer serves as the communication layer between the front-end layer and the back-end layer. SQL is used as the communicating codes between the front-end layer and the databases in the back-end layer. SQL mobile is used as the communicating codes when user accesses the training system through their mobile devices. ASP.Net is a server-side scripting that enable scripts to be executed by the application server and web server. All these tools are basically available as an open source solutions which can reduce the cost of developing this e-training system.
6.2.3 Back-End Layer
This layer is transparent to the user. Both application server and web server would frequently access the database to gain and store information as the user uses the system. Firewall is placed between this layer and middle layer for security purposes.

7.0 Conclusion
The e-training system is developed to offer open, flexible and cost effective way for the organization to provide training for their staff. The system would provide flexibility to the staff as access is possible from just about anywhere and anytime and on many possible devices. As the system is using open source platform, reusability is possible. It also provide opportunities for organizations to cut cost compared to conventional training by removing the needs to look for (physical) training venues, accommodation and transportation costs. Apart from that, e-training also provide mechanism for realizing KM and learning organization culture. This research is still in the early stage of development. Findings and feedback from this stage will assist in further refining of the framework and system architecture suggested in this paper.

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References


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