An E-Learning 2.0 Model

Master of Computing Thesis

Ning Wei

1360025

Supervisors: Dr. Xiaosong Li
Dr. Hossein Sarrafzadeh

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Statement of originality

I confirmed that the research reported in this thesis has not been submitted to any degree study at any university or academic institution. Also, the thesis does not contain any materials that have been published or written previously by any other person except where due references are made. Finally, I confirmed that all the work for this thesis is my own original work.
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Abstract

It has been almost 6 years since the term “E-learning 2.0” was first introduced by Stephen Downes. In 2005, Downes announced a very important principle of E-learning. According to his theory, learning content is no longer the privilege of teachers or courseware authors. Learning content could also be created, contributed and managed by students. Therefore, under this theory, e-learning 2.0 has three basic factors; distribution, co-operation and openness. Learning materials could also be reused and redesigned based on the needs and interests of students instead of the lecturer (Downes, 2005). Obviously, e-learning 2.0 changes the way users distribute and share information and interact on the internet. In addition, the conversational learning way (teacher guide) is replaced with a learner-centered proactive process.

In this study research questions about users’ requirements for E-Learning 2.0 are identified and then UML modeling based on thesis questions is presented. To achieve this, an online survey and interviews were used to gather data, and descriptive statistics has been used as the research method.

User requirements for E-Learning 2.0 such as user participation in the learning and teaching process (including sharing, contribution and interaction), and personal learning environments are presented. Findings from this research are consistent with Downes (2005) who suggested that the learner is at the centre of the learning process.
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Chapter 1: Introduction

With the rapid development of internet technologies, especially during the last decade, acceptance of online learning as the main learning method has become more common. The advantages of E-learning are obvious. E-learning not only decreases the cost of learning but also enhances the flexibility of learning (“anywhere-anytime”). However, on the other hand, some researchers have also identified some disadvantages of current E-learning systems, for instance the lack of interaction among users (Long, 2010), difficulty of supporting co-operative work (Zhou, 2008) and out-of-date learning resources (Yang, Fu, Ren, & Wu, 2010) in the learning repository.

O'Reilly (2005) first defined the term web 2.0, stating that any web page capable of “reading and writing” could be considered as web 2.0. Obviously, this technology offers a good method to handle the previous issues of E-learning because web 2.0 has the potential ability to improve the level of interaction, co-operative working and the updating of learning resources. Therefore, as result of this, e-learning 1.0 started to upgrade to e-learning 2.0.

Many students are making considerable use of Web 2.0 applications and tools in their daily lives but not in their learning. The problem is that up to now, E-Learning 2.0 is in the initial stage and the users’ requirements of E-Learning 2.0 and its related model are not very clear in the academic context. Therefore, this study will clarify and explore user requirements of E-Learning 2.0 then build the E-Learning 2.0 model by using UML. E-learning is about integrating information technology (IT) into pedagogy; this study will give more attention to the IT aspects than to pedagogy, but may lead to expanded use of e-learning 2.0.

However, no matter how good this new technique is, how to adapt and deploy it for different learning styles is a pivotal process. Consequently, the first priority is to find out what kinds of user requirements of E-Learning 2.0 there are. According to Ebner (2007), E-Learning 2.0 can be formulated as

\[ \text{E-Learning 2.0} = f (\text{e-Learning 1.0}, \text{Web 2.0}, \text{human factors}). \]

Accordingly this study explores user requirements of e-learning 1.0, Web 2.0 and human factors by conducting an online survey and interviews of persons who have experiences of E-Learning 1.0 (Blackboard) and Web 2.0 and then using descriptive statistics to analyze the data. In addition, because E-Learning 2.0 is in the initial stage, users may not have very clear requirements. Therefore, in this research, the reasons for learners to choose these Web 2.0 techniques, the usability of web 2.0 techniques and the function modules of current learning systems (Blackboard and Moodle) were considered. This is also the reason for the four sub questions (concerning experiences of Blackboard and Moodle, advantages and disadvantages of Web 2.0, and how Web 2.0 can be applied to learning), to be considered.
This thesis builds on the work of earlier authors, such as Banerjee (2010) and Soler, Boada, Prados, Poch and Fabregat (2010), by using UML to model an e-learning 2.0 system based on actual user requirements obtained from a survey and interviews. UML is a software design language that is used by designers, programmers and analysts (Banerjee, 2010; Alanazi, 2009; Cavalli, Maag, Papagiannaki, & Verigakis, 2005). In this study, UML is used because it provides a commonly understood graphical representation to capture the user requirements in modeling a new E-Learning system. For instance, many users gave their requirements on participation, communication, interaction and co-operation in this study. Therefore, use cases and activity diagrams of UML will help identify whether those requirements are capable of implementation (become the functionalities of the system) in the real system. Also, UML clearly explicates the roles and responsibilities of the users in the real E-Learning system.

This thesis is organized as follows: first, current literature that explores the web 2.0 and E-Learning 2.0 domains is presented (chapter 2), then the research method is described (chapter 3). After that, the data collection and analysis are discussed (chapter 4), user requirements for an E-Learning system based on the data analysed are presented (chapter 5), and in the final section (chapter 6) the UML modeling based on the user requirements is presented.
Chapter II Literature review

2.1 Literature review map

In this literature review, research into web 2.0 and e-learning 2.0 is explored. Most of the articles have been published between 2007 and 2011, and on IEEE, SAGA, and Springer link. A literature map for this review is shown below in Figure 2.1.
Part A

2.2 Background of web 2.0 and e-learning 2.0

During recent years, many researchers have conducted studies on web 2.0. The impacts of web 2.0 not only change the way people use the web but also change the way people develop web technology. In this section, a literature review about the background of web 2.0 and e-learning 2.0 is presented. First, the characteristics of web 2.0 are discussed, next, the impacts of Web 2.0 on e-learning are presented, then current Web 2.0 applications in learning are discussed, finally, E-Learning 2.0 is described and explored.

2.2.1 The characteristics of Web 2.0

The core purpose and functionality of Web 2.0 is to use “read & write” web pages instead of “read only” web pages. The core concept of web 2.0 is user-centric, which means the user creates and manages their own website or resource. Best (2006) summarized the main characteristics of Web 2.0 as participation of the user, dynamic content, scalability and contribution by the user of rich experiences. However, other characteristics such as open source, free of cost and collaborative working can also be considered as attributes of web 2.0.

Vossen and Hagemann (2007) presented the main characteristics of Web 2.0 as shown in Figure 2.2.1a below. According to Vossen and Hagemann, any Web 2.0 application contains three different elements, which are represented by data, functionality and socialization. Data is the data created by the user with any web 2.0 application. In this situation, for example, these are comments, feedback or files created by the user. Data is created by Web 2.0 is reusable. Functionality comprises the main functions of Web2.0 technology, for example, Blog, which can be used to share information with others or obtain feedback or comments from another person. Finally, socialization, which means Web 2.0 applications enable participation and interaction of users.
In 2007, Wever, et al. listed the characteristics of web 2.0 as sociological, technological and economic perspectives.

The details of Web 2.0 characteristics can be summarized as follows:

### 2.2.1.1 Micro contents

“Microcontent is the prime resource and valuable asset of Web 2.0” (Hu, Cai & Talib, 2010, p. 38) and micro content is a kind of data that is established by users. For instance, this data can be considered as feedback, comments, an article published in the learning space or the discussion topic conducted in the forum. All of these data types can be treated as micro content. According to Hu, et al., becoming a consumer or producer of Microcontent is very popular in Europe. More than half of online users...
like to make comments in Blogs, release video or video files from their own learning space or other web sites, or become social network contributors.

Micro content of Web 2.0 is also reusable. Any person is able to use Web2.0 tools such as RSS, Tags or other applications to reorganize, manage, remove or separate micro-content based on their own requirements.

2.2.1.2 User-centric

Under web 1.0, any webpage is focused on the website itself not the user. For example, in an e-learning website like Blackboard people concentrated on the information on the web page. Therefore, they gave more consideration to what kind of the knowledge that students have learned and what kinds of learning resource have been uploaded by teachers, but paid little attention to user-centric activities or information. Web 2.0 gives more opportunities for the user, in other words, it is user-centric based. All Web 2.0 applications are built for specific functional modules and the users are able to select specific functions and then use these modules to meet their requirements. For instance, Web 2.0 applications such as Weblogs and WiKis empower users to create their own content.

2.2.1.3 Socialization

Socialization can be considered as a general characteristic of Web 2.0. Web 2.0 focuses on a person centric approach. That means any person can generate their own content and/or request content from others and then find a way to meet these demands. Web 2.0 allows peers to share, collaborate and publish own ideas and experiences with groups of people who share the same interests.

Web 2.0 applications such as WiKi, Weblog, SNS (Social network services) and Forum are based on social interactions and have the potential ability to support and enhance social learning (He & Wang, 2010). Therefore, according to Liu, Ma, Ru, & Guo (2009), web 2.0 social interactions not only enhance the interactions between each user but also generate rich content. As a result, the value and attraction of such user-generated information increases.

2.2.1.4 User participation

User participation is discussed by many authors conducting research on Web 2.0. (Bai &You, 2010; O’Reilly, 2005; He &Wang, 2010; Safran, Helic & Gütl, 2007). Under Web
2.0, the previous pure “read only” web page has been replaced with “write & create” web pages. Consequently, the role of a web user has changed from pure information receiver or watcher to information creator or contributor. In addition, this feature enlarges the participation of the user because it gives a chance to someone who may not have previously had the right to contribute information. Information contribution is no longer a few people’s privilege. “The broad participation in the construction of Internet content becomes possible” (Liu, et al. 2009, p. 375).

2.2.2 Impact of E-Learning on international students

The impacts of E-Learning on international learners can be summarized using 3C’s: Communication, Cooperation, and Community (Požgaj & Vlahovi, 2010). This means each international individual learner is able to improve his / her knowledge through

1. Communication
To communicate with other international/ local peers by using synchronous or asynchronous communication methods

2. Cooperation
To work with other international / local peers by sharing and exchanging the learning contents or thought

3. Community
To build communities based on the same interests and study topics.

However, because of the difference of human factors (personal hobbies or characteristics), cultural, ethics, religion or even government policy, E-learning may not break the barriers between international learners and locals. For example, people in NZ may use a popular social network like Facebook to build a personal learning environment, but it cannot be used in China. Because firstly, access is not allowed (government policy) and secondly, the most popular social network in China is QQ not Facebook (Meng & Zuo, 2008).

2.2.3 The impacts of web 2.0 on e-learning

Web 2.0 applications are altering the entire landscape of the internet by improving interaction and participation among each end user. In the opinion of the author of this thesis, three important impacts of web 2.0 on e-learning are:

- Establishing a good personal learning environment
- Improving collaborative working
- Improving sustainable learning
2.2.3.1 Establishing a good personal learning environment

Each learning process or action is supported by a specific environment, and a learning environment may also be enhanced by the development of specific new technology. In general, learning environments consist of several components, such as physical equipment (for example webcam, speaker, microphone, mobile phone or even printer), learning resource database, learning group and community.

In Web 2.0 technology, it is easier for the user to adopt tools such as Wiki, Blog or even Facebook to create their own personal learning environment. In this learning environment, users can create their own learning group and community based on their specific requirements or learning targets. Also, users can search learning materials and share ideas with other people. Users in their own learning environment will manage their learning resource and process.

Oliveira and Moreira (2010, p.1173) presented a structure of personal learning environment based on the Web 2.0 application (figure 2.2.3.1).

Finally, personal learning environments under the Web 2.0 can be related to the theory of the long tail (Anderson, 2006). Firstly, the web 2.0 network enlarges the scope of personal networks. Via traditional networks, individuals usually contact people known previously. Secondly, the web 2.0 network solves the issue of time restriction. Under a traditional network, it is hard for a person to update their personal information, and it is not easy to inform others in their community. Therefore, the relationship among people is likely to break down because of the lack of interaction in physical space. However, Web 2.0 allows users to manage their
information, so this issue is less likely to exist. For these reasons there is the potential to exploit the long tail of personal environment (Albrecht, Hungenberg, Denker & Mauch, 2008).

2.2.3.2 Improving collaborative working

Web 2.0 presents a new pattern of collaborative working for people. Under Web 2.0 technology, collaborative working such as group assignments or discussions becomes more convenient.

Under Web 2.0, the user has the right to establish groups and communities, and then to invite people to join these. Therefore, the user can interact, share or distribute information to other group or community members. Google applications provide a convenient way for the user to conduct co-operative work. For example, in a group assignment, the user just needs to create a document by using Google Docs and then share this with other group members, and then this is the only document that needs to be edited by any member in this group. What is more, group members can communicate simply through using the talk window of Google docs when they are editing the document.

2.2.3.3 Improving sustainable learning

The term “sustainable learning community” was first used by Clarke (2009) who pointed out that a “sustainable learning community” is “an emerging network that is an interdependent construct of human activity.” Therefore, a “sustainable learning community” consists of “a diverse set of communities of connection, communities of place, communities of interest and communities of action” (Clarke, 2009, p. 184).

Compared with Web 1.0, a unique feature of web 2.0 is the user-centric based activities, which means any member of the learning environment can build a personal learning community for their own requirements. In these personal learning communities, users can exchange learning ideas or resources with each other. These ideas and resources can then be refined and evaluated by each member in this environment. As a result, some ideas are retained and developed and other ideas are eliminated. This style of interaction and communication should increase the sustainability of such learning.

Web 2.0 also grants users the privileges to manage their own learning resource. These privileges include the operations of resource uploads, downloads, sharing, removing and searching. Therefore, the learning material no longer just comes from the teacher, but comes from the student as well because each person in the learning space has the right to contribute information. As a result, learning materials in this environment are
constantly updated. Not only the learner but also the educator keep updating the learning resource based on their learning targets or interests. Therefore, sustainable learning is enhanced.

2.2.4 Examples of University use of Web2.0 in learning

Compared with other kinds of web techniques, development of web 2.0 is fast (Walsh, 2006). Typical web 2.0 applications such as WiKi, WebBlog, Facebook, YouTube, Second Life and Google applications have been developed and accepted by many Universities in the world as part of their current learning systems.

2.3.4.1 Blog or Weblog

Blogs or Weblogs are typical applications of Web 2.0. They provide a (personal or public) environment or space for presenting users’ individual personalities or characters that may be of interest. The purpose of using a Blog is to improve the interaction between learner and educator by building a PLE (Personal learning environment). For instance, when a topic has been published, each user is able to make a comment, so the topic publisher can easily obtain feedback from other users in a timely manner. An example of a Blog in learning is the ELT (English Language Teaching) project of Shandong Economic University (Ding, 2008).

2.3.4.2 Google applications

According to Chen (2009), Google applications are one of the types of online office suites. This is a typical example to present for the ‘share and communicate’ principle of Web 2.0. Through Google applications, users are able to share ideas or documents instantly with each other.

From October 2009, Monash University of Australia started to integrate Google applications (including Google Docs, Calendar, Google talk and Gmail) into formal teaching. These online tools enhance the learning experiences of students through improved communication, collaboration and interaction.

2.3.4.3 Podcasting

The word “Podcasting” consists of two parts, one is “iPod” of Apple (Macintosh) and other is broadcast. Now, it defines some types of audio or video file that are published
through the internet. The user can subscribe to the video or audio seeds and then receive these podcasts automatically. This method presents a very popular way to use web 2.0. Some lecturers like to record the class process by using iPod, after that they transfer the files to mp3 and publish on a website for the student to download. A topical example is the Stanford iTunes University (Stanford on iTunes U, 2008), that is a working project between Stanford and Macintosh. Stanford iTunes University offers some digital courses that students are able to subscribe to via Apple’s iTunes. The evidence from this study proved that learners are glad to use this system for their study, because they believe podcasting blurs the boundary between the educator and learner, and that they are not only learners but also creators, researchers and broadcasters.

![Figure 2.3.4.3 The virtual classroom in Stanford University](Picture retrieved from iTune in Stanford University, 2008)

### 2.3.4.4 Second Life

Second Life is a popular 3D website used globally. Based on the statistics of Fortune Magazine, Second Life started in 2003 and now there are over 13 million registered users and about 10,000 people become new members each day (Li, 2010). Through this website, users are able to create their virtual representatives, so called “avatars”, and then use these virtual people to conduct actions or participate in events in this virtual world. Harvard Law School adapted its learning program by using Second life in 2007 (Li, 2010). In addition, since 2008, Scott G started to use Second Life to conduct the teaching of Chinese in Monash University. According to Li (2010), in order to research the adoption of Second Life, Monash University purchased a virtual Island from the Second Life.
2.3.4.5 Wiki

The purpose of a WiKi is to give people a chance to participate in the contents of the Wiki for its updating and maintenance. Thus, a WiKi is a system that provides an opportunity for the user to build an open community. Through this community, each user participates equally to distribute the opinion and resource. According to Hung-Ling (2009), WiKi supports E-learning from a social and cultural aspect, through social interaction such as collaborating, editing or synthesizing different ideas, thereby enhancing the learning process. One example of the use of WiKi is Charles University Environment Centre (CUEC). This university uses “Media wiki software as the basis of its e-learning strategy in the field of ESD (education for sustainable development) at university level” (Dlouha & Machackova, 2008, p. 168).

2.3.4.6 YouTube

YouTube is an online video website that can support the user to download, upload, search, share, watch, or create videos. In 2007, the University of California Berkely began to use YouTube to upload course videos. The University of California Berkely is the first university in the world to upload course videos to YouTube. Each visitor only needs to access youtube.com/ucberkeley, where there are more than 300 hours videos and events available to them. ETS co-manager of webcasts at Berkeley, Ben Hubbard said "We are excited to make UC Berkeley videos available to the world on YouTube and will continue to expand our offerings." (Mark, 2008)
2.3 What is e-learning 2.0?

E-Learning may have different meanings for different people. For instance, for a company, E-Learning can be used to provide a training course, for an educator, E-Learning can be used to deliver an online programming course. Based on the definition of Maja, Bostian, and Marjan (2010), “E-learning is a term for all types of technology-enhanced learning services and processes, including computer-based learning, web-based learning, the virtual classroom” (p. 1).

E-learning 2.0 can be considered as a way of adopting Web 2.0 applications for learning processes (Casquero, Portillo, Ovelar, Romo, & Benito, 2010). Through using Web 2.0 applications, E-learning 2.0 can enhance the functionality of the previous learning system (E-learning 1.0), for example, teamwork, interactions and information distribution. A similar idea comes from Christy and Matthew (2009), who indicated that Web 2.0 makes the internet more “interactive, customized, social, and media intensive” (p. 279). The main role of E-learning systems will be changed from medium of information (browser or download information) to a platform (information is established, shared, reconstructed). The core idea is that the users are the centre of the entire system. Li and Yu (2010) pointed out that each learner “can build their own learning environment, conduct effective communication and collaborative working” (p.499) and that E-learning 2.0 systems can cater for both independent learners and learning communities. This structure is displayed below:
According to Cui, Wang, and Cao (2008), e-learning has been already developed in three different versions, which are 1.0, 1.3 and 2.0. The table below displays the basic characteristics of these versions.

<table>
<thead>
<tr>
<th>E-Learning 1.0</th>
<th>E-Learning 1.3</th>
<th>E-Learning 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership</td>
<td>Top-down, one-way</td>
<td>Top-down, collaborative</td>
</tr>
<tr>
<td>Access Time</td>
<td>Prior to work</td>
<td>In between work</td>
</tr>
<tr>
<td>Delivery</td>
<td>At one time</td>
<td>In many pieces</td>
</tr>
<tr>
<td>Content Access</td>
<td>LMS</td>
<td>Email, Intranet</td>
</tr>
<tr>
<td>Driver</td>
<td>ID</td>
<td>Learner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Search, RSS feed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Worker</td>
</tr>
</tbody>
</table>

Table 2.3 A comparison of E-Learning versions
(Table retrieved from Cui, Wang, and Cao, 2008, p.136)

Cui (2008), et al. note that E-learning 2.0 presented three characteristics:

- Establish contents easily
- Deliver web page
- Conduct collaborative work.

Downes (2005) was the first person to use the term E-Learning 2.0. According to Downes, under e-learning 2.0, learners are not only the drivers of their learning process but also the creators of their learning content. Uni-directional data flow between the learner and teacher is replaced with multi-directional data flows between different users. In other words, the traditional teaching method (teachers distribute resources) is going to change to user (students and teacher)-centric based.

Another very interesting idea comes from Ebner (2007), who offered a formula of
e-learning 2.0:

E-Learning 2.0 = f (e-Learning 1.0, Web 2.0, human factors)

There are three variables inside this formula, e-learning 1.0, web 2.0 and human factor. The first two variables may be obvious, but why did Ebner put human factors into the formula? Firstly, web 2.0 is a new technology, and people need some time to know what they are doing and to learn how to use a new technology. Secondly, conventional teaching has a significant influence on learners and teachers, all of whom need time to accept the new learning and teaching method.

Another factor is web 2.0; one of the unique characteristics of web 2.0 is to empower the individual to manipulate their own work. As a result, the user is able to create content. Therefore, there will be a change in the structure of the conventional paradigm, which is from “a teacher-centered transmission model to a student-centered holistic experiential model” (U & Corner, 2009, p. 468).

Mitrea & Mitre (2010) pointed out that the main differences between e-learning 1.0 and e-learning 2.0 are the features of collaboration and interaction. Compared with e-learning 1.0, e-learning 2.0 establishes user collaboration and distribution. Besides, e-learning 2.0 assumes that “knowledge is socially constructed” (Mitrea & Mitre, 2010, p. 397). In addition, E-Learning 1.0 is a one-way data flow that is top down. In summary, e-learning 2.0 can be described as “a developed version of e-learning 1.0 that uses web 2.0 techniques in each of the learning processes but focuses on user-centered (learner and educator) holistic knowledge” (Mitrea & Mitre, 2010, p. 397).

2.4 Developing Web 2.0 to Web 3.0

Web 3.0, also known as the Semantic Web, is the next version of the Web. According to Yu (2007) it is “the next step in Web evolution. It is about having data as well as documents on the Web so that machines can process, transform, assemble, and even act on the data in useful ways.” (p. 8). Also, in 2007, Google CEO Eric Schmidt noted that web 2.0 and web 3.0 are only marketing terms, used by marketers and developers, and gave his own definition of Web 3.0 as “applications that are pieced together - with the characteristics that the apps are relatively small, the data is in the cloud, the apps can run on any device (PC or mobile), the apps are very fast and very customizable, and are distributed virally”. The figure below presents the basic structure of web 3.0.
Section B

2.5 Building E-learning 2.0 structure through Web 2.0

This section focuses on involving some Web 2.0 concepts into the design of a new E-Learning system. The structure of an E-Learning system is proposed. The main function of this learning system is to facilitate daily learning processes. However, compared with previous learning systems, this new system displays a new learning style: user-centric. This means that each learning process will follow the requirements of a user. Consequently, it improves participation, interactions and co-operative work among the users in the learning community. This section will describe the new E-Learning system structure with its system components.

2.5.1 Factors of e-learning system

E-learning involves functions such as collaborative working, traditional learning and
learning content management. Web 2.0 provides an opportunity to establish a well-designed learning system for different of users. However, with the development of the internet, demands of users have increased. For example, users have greater expectations about accessibility, flexible learning, distribution and sharing of learning resources, collaborative working and good support. Therefore, in order to design and construct an efficient and effective e-learning system and meet these requirements, three factors should be considered, which are learning models, instructional structure, and learning meta-cognition (Khan, 2005). Learning models involve personal learning environments with tutor guidance and technical support. Instructional structure includes some structured functionality modules that can meet the users’ requirements. Learning meta-cognition “consists of individual problem-solving capabilities and thinking skills” (Khan, 2005, p. 140).

2.5.2 Learning models

A distributed learning model will be used in this case. This model presents features for an E-learning system, which are open source, distributed information and flexible use (see Figure 2.5.2).

![Distributed Learning Model](image)

Khan (2005, p. 140), suggests that the terms “open”, “flexible” and “distributed” in the E-learning area mean the learning is conducted “in the user’s own time, pace and place”. The same idea comes from Calder and McCollum (1998) who defined open learning as implementing learning in own time, pace and place. Saltzbert and Polyson (1995) indicated that distributed learning may have a different meaning compared with e-learning. In their report, they stated:

“Distributed learning is an instructional model that allows instructor, students, and content to be located in different, non-centralized locations so that instruction and learning occurs independent of time and place.... The distributed learning model can
be used in combination with traditional classroom-based courses, with traditional distance learning courses, or it can be used to create wholly virtual classrooms.” (p. 10)

Web 2.0 technology is capable of matching the features of distributed model (open, flexible and distributed) in Saltzbvert and Polysons’ distributed learning model.

2.5.3 Instructional structure

![Khan E-Learning Structure](image)

Figure 2.5.3 Khan E-Learning Structure
(Retrieved from Khan, 2005, p. 148)

In 2001, Khan started to develop his E-learning structure. After four years of research, Khan produced a mature E-learning structure. Khan’s E-learning structure consists of eight different dimensions, which are institutional, pedagogical, technological, interface design, evaluation, management, resource support, and ethical. Each dimension relates to a specific area of an E-learning environment. According to Khan (2005), this structure lists several essential factors that need to be considered for creation of an E-Learning system for diverse users. Selim (2007) also holds a similar opinion. In his report, eight factors are located that have direct impact on the success of E-learning. These factors are: instructor characteristics (attitudes towards and the control of technology, teaching style), student characteristics (computer competency, internet collaboration, e-learning course contents and design), technology (ease of access and infrastructure), and support. Khan’s eight dimensions E-learning model will be used as a theoretical infrastructure in this research.

2.5.4 Three tiers E-learning 2.0 model

In order to incorporate the features of Web 2.0 technologies and applications and of E-learning systems, the author focussed on Khan’s pedagogical, technological, interface design, management and resource support dimensions to build a three tiers E-Learning 2.0 model. Because “open”, “flexible” and “distributed” are typical features
of Web 2.0, this approach is aligned with the distributed learning model. Table 2.5.4 presents the relationship between Khan’s E-Learning structure and the three tiers E-Learning 2.0 model.

<table>
<thead>
<tr>
<th>Khan’s E-Learning Structure</th>
<th>Three tiers E-learning 2.0 model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>Module tier and storage tier</td>
</tr>
<tr>
<td>Technological</td>
<td>Web 2.0 technologies and applications</td>
</tr>
<tr>
<td>Interface</td>
<td>Presentation tier</td>
</tr>
<tr>
<td>Pedagogical</td>
<td>Communication, co-operation, course, learning, question &amp; answer, teaching, and testing modules</td>
</tr>
<tr>
<td>Resource support</td>
<td>File management module and storage tier</td>
</tr>
</tbody>
</table>

Table 2.5.4 Relationship of Khan’s E-Learning Structure and the three tiers E-Learning 2.0 model

The choice of modules is based on the results of the online survey and interviews (see Chapter 4). Functions of modules may overlap, for instance both communication and co-operation involve online chat and instant message.

After combining those two structures (distributed learning model and Khan’s E-Learning Structure) together, the proposed E-learning 2.0 model is presented below:

![Three tier E-Learning model file Learning](image)
There are three tiers in this model, which are presentation, module and data storage. After the users log in, the main interface will be displayed to the users. Users can simply choose any function modules that are presented in the main interface.
2.5.4.1 Presentation tier

The main user interface (UI) is in the presentation tier. In 2006, Bajwa, Siddique and Chaudhary defined user interface as a medium that conducts the communication between the user and computer. This communication is achieved by using some specific applications. In another words, the UI plays a mediating role between the user and the application or OS of the computer. The diagram below presents the role of the UI.

(Figure 2.5.4.1a Basic Process of UI)

Lu and Wan (2007) summarized four main functions of UI: “method calling, message sending, event triggering, data transmission” (p. 541). Another important function of UI is navigation: “UI navigation makes the functional association more clear and evident” (p. 541). Therefore, the functionality of UI can be separated into two main parts. One part is a simple agent that transfers the data or commands between the user and the system, and another is navigation that guides the user to access each function module in the system. The diagram below presents the basic components of the UI.

(Figure 2.5.4.1b UI main functions)

The UI also has an impact on the degree of ease of use for the application. One of the most important factors is accessibility. Accessibility means how easy it is for the user to access each function module. Users will then obtain an initial impression of the software applications through the UI when they start to use each module.

There are some general components or items that can be used in the UI, for instance command buttons, links, icons and menus. All these methods will make clear
connections between the external user requirements and internal function modules of the application.

2.5.4.2 Module tier

This is the main part of the entire E-learning 2.0 system. It includes the modules such as communication, co-operative, online test, learning control, teaching control, Question & Answer manager, course manager and file manager. These modules have been categorized into two main sections based on the education purpose and function purpose. All the modules are created based on the Web 2.0 platform. The system structure displayed below:

![Figure 2.5.4.2 Structure of E-learning 2.0 mgt](image)

The purpose of the next sub-section is to provide the functionalities that are used in the learning system.

2.5.4.2.1 Communication module

The communication module takes control of the communication process and the type of communication methods. Users are able to choose the method that they prefer to conduct communication with each other. In this system, the communication methods are divided into two types, synchronized and asynchronous. The synchronized methods include online chatting (video, audio) and instant messaging (online or mobile), and the asynchronous methods include email, discussion board and online reminder message. Synchronous and asynchronous communication methods have their own advantages. With synchronized communication, users feel as if they are working together because users can respond to other’s ideas immediately. Users can also discuss content that is not restricted to the topic. In addition, synchronous communication induces personal participation, because it empowers “higher sentence counts, more dense perceived social networks, and stronger perceived participation”. (Hrastinski, 2010, p.143) However, asynchronous communication gives more time for the user to think over and then to make responses (comment or feedback). As a result, asynchronous responses may be better prepared than synchronous communication. According to Hrastinski (2010), synchronous
communication is a complement of asynchronous communication. Therefore, leveraging the synchronous and asynchronous communication is the key success factor for this module.

2.5.4.2.2 Co-operation module

The co-operation module is built under the user-centered based level. Therefore, the users must control the learning process to build public knowledge for each other. So providing support to the group work for any tasks is a priority role for this module. As a result, a shared interface is established to conduct group work for group members.

A. Principle of the co-operation module

Collaborative working improves learning by encouraging peers to interact and share ideas with each other. The main features of web 2.0 are user participation, information sharing and distribution. Therefore, these characteristics will allow the users to add value to the whole system.

According to Xu (2008), this module design has four elements, which are “interaction, individual accountability, team work, and personalized guidance.” (p. 47)

Interaction
During the traditional class, face-to-face interaction is the main channel to conduct communication with another person. In this module, learners are able to discuss with the lecturer face-to-face because the system has video and audio support. In order to provide this support, extra devices such as Webcam, speaker and microphone are set up in this module. Web 2.0 applications such as MSN, QQ, and Skype can also be utilized here.

Individual accountability
Individual accountability means learners can publish their ideas, thoughts and information by using some applications like Blog and forum within an authenticated identity. Those users publishing comments and feedback will be instantly visible to other people. Learners can make comparisons of their studying with others and then keep, develop or abandon learning documents and ideas.

Teamwork
The learner is able to develop strong co-operative and interpersonal skills as part of a team. Using web 2.0 applications such as Google group and forum, learners can build a group and share information, ideas and thoughts with other team members.

Personalized guidance
The comments and feedback of the teacher as well as other learners play an important role during the process of learning. Through using some Web 2.0 applications, for instance, Blog and forum, the learner is able to obtain responses and comments instantly. This useful information helps learners to adopt other learning processes easily.

2.5.4.2.3 File management module

This module is in charge of the management of any kinds of files that are used in the system. These files are divided into two main parts. One is system files, which include user personal information, user account information, user operation logs, and system logs. Other files are learning materials that include lecture notes, previous exam papers, class exercises, previous class video and audio files, searching resources (Chen, Wu, Song, Zhan, Chen & Kang, 2009). The learning files are categorized based on the course and learning objects or targets.

By using this module, the user is able to locate needed files and download these files, and also they can upload files, share with another person, or watch and listen to video or audio files, as well as remove any files from their own personal space. Also, users are able to search the learning resource through the search engine by typing some specific keywords.

Finally, this module provides functions for the user to establish their own learning content dynamically, which means it can offer the learning content based on the learners’ needs. All the learning resources based on the specific learning standard can be shared and reused (Liu & Sun, 2008).

2.5.4.2.4 Course management module

According to Liu et al. (2010), course management is one of the important function modules of E-Learning system. The course management module is for managing the course in which a learner enrolls. There are three sections in this module, which are course development, virtual classroom (course materials, course resource searching and publishing, real-time online course) and course online evaluation. This module enables student to do the tasks that are listed below:

- Download all the course materials (lecturer notes, PowerPoint handouts, exercises, course videos and audio files, test papers)
- Search and publish related resources,
- Participate in real time classes (including class discussion and exercise)
- Contribute and exchange searched course resources
- Evaluate the course
The structure of the course management module is presented below:

![Course management module diagram]

**Figure 2.5.4.2.4** The structure of course management module

### 2.5.4.2.5 Learning control module

The learning control module is in charge of the learning processes in the system (Wang, Li, He, Zhang & Dai, 2009). These learning processes involve learning method, contents, establishing and managing the learner information. This module is designed for the students to conduct the learning process, which includes four main sub sections: personal space, virtual classroom, collaborative platform and learning kit. This module is the most important section of the system. The framework is presented below:

![Learning control management module diagram]

**Figure 2.5.4.2.5** The structure of student learning control management module

**Personal space:**

Students can manage their own personal information by using this module. Besides, some personalization settings such as main colour, font types, personal representative are included in this module.

The virtual classroom involves four parts that are online real-time class, assignment and exercise, online testing and learning resource manager.
Online real-time class
This is real time online learning, so some external devices such as microphone, speaker and Webcam must be configured before starting to use such devices. Also, like any formal learning, learners must enroll in the course prior to using this function. The online course is started at the predetermined time and each student as well as the teacher will enter the virtual course at this specific time. The teacher use the microphone to conduct the teaching process, if any learners have questions, they can use instant messaging to contact the teacher.

Assignment and exercise
Learners can use this function to complete and submit assignments and exercises. The teacher’s assessment of the assignment (exercise) can be viewed by the learners as well.

Online testing
This module aims to test the achievement of learners. Therefore, learners participate in a course test at a specific time, before submitting their answer paper. This testing can be interrupted and resumed, after the submission students can view the result immediately.

Learning resource manager
This function is to store class (video or audio) files. In general, after finishing one lecture, the video file of this lecture is uploaded and the learners who are absent from this lecture can downloading it to watch the whole class at any time and place.

There are four sub sections in the collaborative platform, which are class forum, class documents and class Podcasting.

Class forum (group)
Learners can create their own group and then invite people to participate. After that, any group member can publish a topic and exchange ideas, thoughts and learning skills with each other.

Class documents
This function is designed for group assignment use. If one group member creates a document they can then share this document with another person and even grant them the editing privilege. After that, any member of the group is able to use (edit) this document at the same time.

Class podcasting
By using this function, learners can easily release any video or audio files for others.

Learning Kit
This includes IM, search engine, and Tag.
IM (instant message)
This function is able to help learners to communicate with others immediately.

Search engine
This function offers support to learners to find information from the internet. RSS is used in this function, as a result of this, updated course resources will be sent to learners regularly.

Tag (bookmark)
The purpose of this function is to help learners to categorize the learning resource based on the requirements, for instance, picture, document, and video.

2.5.4.2.6 Teaching control module

The purpose of this module is to provide the teacher with functional elements (Wang, Li, He, Zhang & Dai, 2009). By using this module, teacher is able to perform these tasks:

- Conduct real-time online course teaching
- Upload any teaching contents (learning resource)
- Answer questions (real time or not)
- Mark assignments (or exams)
- Give feedback or comments
- Manage student accounts
- Search learning resources
- Set the space.

According to these tasks, the structure of teaching control module is displayed below:

![Diagram](image)

Figure 2.5.4.2.6 The structure of teaching control management module

This module is also to provide the help for the teacher to select learning resources and build teaching strategies.
According to Shum and Ferguson (2011, p. 11) “A significant feature of the Web 2.0 paradigm is the degree of personalization that end-users now expect”. Therefore, setting up personal learning and teaching environments is quite important for the whole learning system.

2.5.4.2.7 Question & Answer module

According to Budalakoti, Deangelis, and Barber (2009) the question and answer module creates the connection between user and the resource “that can leverage both the static and dynamic (live) capabilities of a network of human users” (p. 481). This module provides an opportunity for users to enquire and provide answers for each other. Therefore, data must be exchanged successfully between peers and users need to locate the appropriate expertise based on the enquiry question.

Two types of communication (synchronous and asynchronous) are used in this module. Synchronous communication includes online chatting (video, audio or text), and instant message to mobile; the content of answer can be saved in the personal space based on the user’s requirement. Asynchronous communication involves discussion board, group forum and email. Users are able to select any option that they like for communication.

Web 2.0 applications used in this module will be Facebook, MSN and Blog

2.5.4.2.8 Online Testing module

This module is in charge of the process of testing in which the learner participates. This module consists of two main sections, one is a repository of previous test papers and the other is the online real-time test.

Repository of previous test papers
This section is capable of helping the learner to access previous test papers for the course. There are two ways to access the needed previous paper. One is through a search engine, in which learners are able to locate the test paper by typing key words in the search engine, and the other is to go directly to the exact paper page that the student intends to find.

Online real-time test
The online real-time test consists of two parts, one is question repository and the other is the online test.

A question repository is to help the users to upload or create the test questions. The
questions are categorized based on the specific course within related learning objectives or targets.

The test section will randomly generate a formal online test paper based on a question repository. Learners are then able to participate in the test at a specific time. Learners can interrupt or resume the test during the process of testing, but once the test paper has been submitted, they are not allowed to resume. Meanwhile, the test result will be generated and then saved in the test database. The formal result will be released after checking by the teacher. After the teacher completes the checking work, he/she will type the grade into the grade book and generate the formal assessment, and then learners can see the entire result.

The basic process for online testing is presented below:

![Diagram of online test process](Retrieved from Pang, Yang & Bian, 2009, p. 3)

2.5.4.3 Data storage tier

The data storage tier is at the bottom of the whole system structure. The purpose of this tier is to store all the data in the system. These data have been categorized into four main types; user information, system information, learning resource and learning strategies and plan. The data in this database are user personal information, user account information, learning resource, current and previous test papers, Question & Answer, and learning strategies. The structure of data storage is presented below:
2.5.4.3.1 User information

The details of User information are saved in two unique databases, which are user personal and user log. The purposes of those databases are listed below:

<table>
<thead>
<tr>
<th>Database name</th>
<th>Information stored</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>User personal</td>
<td>Personal Information of user include Student ID, name, contact details, and so on</td>
<td>To store user personal information</td>
</tr>
<tr>
<td>User log</td>
<td>Operations and the time taken by the user</td>
<td>To record the operations done by the user and trace the activity</td>
</tr>
</tbody>
</table>

Table 2.5.4.3.1 The details of user information database

2.5.4.3.2 System information

System information is saved in two databases, one is a system log and the other is a user account.

<table>
<thead>
<tr>
<th>Database name</th>
<th>Information stored</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>User account</td>
<td>Login name, password, privilege</td>
<td>To store user name, password and related privileges</td>
</tr>
<tr>
<td>System log</td>
<td>Operations and the time taken by the system</td>
<td>To record the operations done of system and trace the individual activity</td>
</tr>
</tbody>
</table>

Table 2.5.4.3.2 The details of system information database
### 2.5.4.3.3 Learning resource

A Learning resource is stored in four different databases which are expert, individual, Test and Question & Answer. The detailed information for each database is listed below:

<table>
<thead>
<tr>
<th>Database name</th>
<th>Information stored</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert</td>
<td>Any learning materials that are created, shared or uploaded by the expert (may involve video or audio).</td>
<td>To provide expert learning support to the user</td>
</tr>
<tr>
<td>Individual User</td>
<td>Any learning materials that are created, shared or uploaded by the individual (may involve video or audio).</td>
<td>To provide learning support to another user</td>
</tr>
<tr>
<td>Test</td>
<td>Previous test questions and paper</td>
<td>To help the user to review the knowledge</td>
</tr>
<tr>
<td>Q &amp; A</td>
<td>Current and previous questions and answers that the user issued</td>
<td>To help the user to solve problems in the learning process</td>
</tr>
</tbody>
</table>

Table 2.5.4.3.3 The details of learning resource database

### 2.5.4.5 Learning strategy

According to Williams and Burden (1997), a learning strategy is the kind of process that the learner uses to handle and to solve the learning task. Lee (2010) simply defines learning strategies as: “learning skills, learning-to-learn skills, thinking skills, problem skills or, in other words the methods which learners use to intake, store, and retrieve during the learning process” (p. 134).

The learning process under e-learning 2.0 is diverse compared with traditional e-learning (for instance, Blackboard). As a result, a conventional pedagogical strategy needs to change to fit the features of the new learning system. In online collaborative learning, one of the techniques called blog-based dynamic learning map is used to build a special map for learning (Wang, Huang, Jeng, & Wang, 2008). Blog-based dynamic learning maps are designed to offer useful information for the learner in order to facilitate collaborative learning processes.

The details of the system database used to store the learning strategies are shown below:
<table>
<thead>
<tr>
<th>Learning strategy name</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online collaborative learning</td>
<td>To provide the collaborative learning plan to the user</td>
</tr>
<tr>
<td>Online self learning</td>
<td>To provide the learning objective and plan of course to the user</td>
</tr>
<tr>
<td>Online teacher guide framework</td>
<td>To provide the entire learning framework to the learner. Help the learner to obtain the key points and knowledge of the course</td>
</tr>
</tbody>
</table>

Table 3.4.3.2 The details of learning strategy database

### 2.5.5 Basic learning Process in E-learning 2.0

The learning process of E-Learning 2.0 is quite different from E-learning 1.0. The big change is that the learner is in the centre of the learning system, contributes to the learning resource, and focuses on self-learning. The lecturer provides a learning framework and guides the learning process and direction for each learner. The general learning process of E-learning 2.0, according to Li and Yu (2010, p. 500), is presented below:

![Figure 2.5.5 The learning process based on e-learning 2.0](Retrieved from Li and Yu, 2010, p. 500)

In e-learning 2.0, the basic learning process will be, firstly, the learner uses web 2.0 applications such as WiKi, Weblog, Forum, RSS or some social networking services to build a personal learning environment. Then the learner may create or join a group or community in which they are interested. After that, the learner is able to conduct learning activities and processes in the learning environment, for instance, they could communicate with another group member by using IM (instant message), email or any other kind of social network services (Facebook, Second life). Learners can also obtain feedback, comments or share experiences or ideas by using Weblogs and forums, and they can conduct online collaborative working by using Google docs or WiKi.
2.5.6 Using UML to design E-Learning system

UML means Unified Modeling Language and is an object-oriented system analysis and design tool that is able to provide a generic prototype design for the developed system. The final process of this study is to use UML to model user requirements. UML consists of nine diagrams that are listed below:

- class diagram
- object diagram
- use case diagram
- sequence diagram,
- collaboration diagram
- state chart diagram
- activity diagram
- component diagram
- deployment diagram

Therefore the user can use different diagrams to present different aspects and functions of a system. According to Banerjee (2010, p. 23), because UML “is used very efficiently to design the model of e-commerce system ... it can be used to design the blueprint of the e-learning system”.

Using UML to model systems is very popular because it is a very efficient tool to help the people to construct their OOP (Object Oriented Programming) structure. For instance, Peng and Jin (2010) apply UML to design graduation project management, Banerjee (2010) uses UML-based approach to design a secure model of an e-learning system, and Soler et al. (2010) use UML class diagrams to design a web-based e-learning system. According to these authors, UML is a good and efficient tool that is able to well reflect the requirements of the users and also a suitable application to test whether those requirements can be implemented in the real system. For example, user requirements provide the important identification and description to the use case, and the use case diagram can be used to test whether the identification and description are suitable in the system because “use case diagram describes typical scenarios in the form of a textual description of a real flow of events” (Snyder, 2011, p. 136). Through using UML, complicated users’ requirements will become simple, clear and easily transferable into the functionality of the system. However, UML cannot represent some requirements for instance, system stability or availability, which are impossible to represent.

Through using UML, complicated users’ requirements will become simple, clear and easily transferable into the functionality of the system. This thesis builds on the work of earlier authors such as Banerjee (2010) and Soler et al. (2010) by using UML to model an e-learning 2.0 system based on actual user requirements obtained from a survey and interviews. However, as noted by Sanchez and Monzon (2001) and Dorsey
(2004), UML cannot represent some requirements (for instance, system stability or availability).

### 2.5.7 Comparisons of learning systems

Two popular E-Learning systems called Blackboard and WebCT are widely used in Europe and the United States (Li, Ni, Zhou & Zheng, 2009). In fact, Blackboard (BB) and WebCT are quite popular in New Zealand too; AUT and Unitec have used Blackboard since 2004, and Massey University has used WebCT since 2005. According to Machado and Tao (2007), 80-90% of secondary schools and universities have used Blackboard and WebCT as their learning system. However, recently a new learning system called Moodle (Modular object-oriented dynamic learning environment) has become very popular. Compared with WebCT and Blackboard, Moodle gives more attentions to users, in other words it is more personal and flexible. Under the Moodle system, users are able to create needed function modules (Guerrero, Forment, Gonzalez & Jose, 2009). Moodle is also low cost compared with Blackboard and WebCT. However, Moodle still has disadvantages; according to Li et al. (2009), Moodle has “limitation of course management”, “lack of autonomous sense” and is not easy to use for people who do not have much IT experience (p. 40). Table 2.5.7 compares systems (based on Li et al., 2009; Guerrero et al., 2009; and Machado & Tao, 2007).

<table>
<thead>
<tr>
<th></th>
<th>Cost</th>
<th>Technical support</th>
<th>Information control</th>
<th>User centric</th>
<th>Ease of use</th>
<th>Popularity</th>
<th>Flexible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>High</td>
<td>Good</td>
<td>Good</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>WebCT</td>
<td>High</td>
<td>Good</td>
<td>Good</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Moodle</td>
<td>Low</td>
<td>OK</td>
<td>OK</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 2.5.7 Comparisons of learning systems

Thus, the disadvantages of Blackboard and WebCT are:
- Very expensive,
- Very rigid layout
- Not user-centric, and still based on the traditional learning method
- Based on Web 1.0 technologies.

The disadvantages of Moodle are:
- Not very popular
- Not easy to use, user needs to be trained before using
- Technical support is not good enough because it is based on open source
- Too flexible (lack of control of user operations like contributing information, layout of web page)
Human factors (some learners and teachers still prefer the traditional learning method).

2.6 Summary and further research

The topic of adoption of Web 2.0 applications into learning has been discussed by many researchers and educators in recent years. For instance, in 2009, a European report generated by Redcker, Ala-mutka, Bacigalupo, Ferrari and Punie, considers deeper research about the impact of web 2.0 on e-learning like the improvement of personal learning environments, collaborative working, communication and interaction among the users.

In this chapter, the background of web 2.0 and E-learning 2.0 has been introduced. Next, a three tier E-learning 2.0 system has been presented based on Web 2.0 applications. Then the details of each module in the different tiers have been described. Web 2.0 applications cover most aspects of what is available on the internet. The social characteristics of web 2.0 appear to empower the process of E-learning. Therefore, with more and more web 2.0 applications being developed and accepted in learning, the educator’s role changes. Learners begin to contribute and distribute learning materials in their own personal learning environments although learning is still under the control of the teacher. The teacher’s role therefore changes to giving support to learners and guiding their entire learning direction. So, the teacher-centric based will be replaced with a learner (user) -centric based approach.

The next step was to test and refine this three tier module. In order to do this task, an online survey was sent to participants to gather data and interviews were conducted with those participants who consented. After the completion of the online survey and interviews, the three tier E-learning 2.0 module was checked against the results of interviews and survey.
Chapter III Research Method

This study focuses on addressing requirements of an E-learning 2.0 system. The primary research questions are: what are the user requirements of E-learning 2.0, and how can an E-learning 2.0 system be modeled using UML in line with these requirements? To help answer these questions, the following secondary questions were posed: what are the user experiences of Blackboard and Moodle, how is Web 2.0 used in learning, and what are the advantages and disadvantages of Web 2.0? Therefore, to deal with these questions, this research will follow the process illustrated below (Figure 3.0).

Figure 3.0a Research progress

In this research, descriptive statistics have been used to analyse data captured in the online survey as well as the interviews. Descriptive statistics were used to obtain “straight descriptions of phenomena” (Sandelowski, p. 339, 2000), and to help the researcher to obtain very clear requirements for the E-Learning system. Hypothesis testing was not used because the interview and survey participants were not random samples.

Sarantakos (2005) listed some techniques that can be applied for data analysis. These common techniques are listed below:
- Pattern-matching
- Explanation-building
- Time-series analysis
- Making repeated observations
(Sarantakos, 2005)
This investigation uses explanation-building for the data analysis. Sarantakos (2005) indicated that explanation-building “is based on a series of iterations” (p. 215). Therefore, the standard data analysis procedure follows the steps below:

Step 1: based on the literature review, issue initial proposition: Learning management system using Web 2.0 applications is capable of improving participation, interaction, communication, co-operation, and personal learning environment among the users.

Step 2: check with the result of the online survey.

Step 3: if any discrepancies are found between the findings and the proposition, the proposition needs to be revised based on the findings.

Step 4: check with the result of student interviews and staff interviews, new findings are obtained, and the proposition is then compared with the new findings.

Again, if a discrepancy is identified, the proposition must be revised based on the findings.

The main procedure follows the diagram below:
In order to obtain the user requirements for this study on e-learning 2.0, an online survey was conducted with Unitec Institute of Technology computing students and a Facebook community from December 2010 to Feb 2011. Also, interviews were conducted with six Unitec students and six Unitec lecturers. Participants were recruited in two ways; one was by email sent to the Blackboard email list for Unitec MComp students; the other was by adding the URL for the online survey to the researcher’s Facebook page.

The online survey and the interviews focused on the following subjects: perception of using Web 2.0 applications (Facebook, YouTube, Second Life, WiKi), such as usefulness and consequences after using. The survey also concentrated on learning types, relative time consumed by these Web 2.0 applications, and comparisons with using learning systems such as Blackboard and Moodle. Finally, some functionality of E-Learning systems, for instance course management and file management, were listed in order to identify function requirements for the user.

The survey was distributed to two main groups: NZ Unitec students who are currently taking post graduate studies in computing (84) and participants in a Facebook community who are studying computing at other tertiary providers in NZ (198). All users were experienced with web 2.0 applications and common learning management systems. 84 participants returned a valid response, with 39 being female and 45 male, 36 being Unitec students and 48 being people contacted via Facebook. Participation in this study was voluntary.

In addition, Unitec staff and students involved in the postgraduate computing programme were sent an email inviting them to participate in an interview within a specified timeframe, and the researcher then arranged the interviews with all those who were available. The participants interviewed were six lecturers and six post graduate computing students. All of these participants were experienced with BlackBoard, Moodle and common Web 2.0 applications like WiKi, Blog, SNS (Social network service like Facebook, YouTube), IM (Instant message like MSN, Skype) that indicated that the internet was the part of their daily life. More particularly, one lecturer was employed in a learning centre, one was doing technical support for Moodle and the rest were course lecturers.

Table 3.0 summarizes the demographic information of the survey participants.
Table 3.0: Demographic Information

The final process is to use UML to test those requirements that are gathered from participants. The purpose of UML is to clarify and identify whether these requirements can be implemented in the real system.
Chapter IV Data collection, analysis and discussion

4.1 Data collection

In this section, the data gathered (using an online questionnaire and interviews) are presented.

4.1.1 Description of Online survey Data

1. Please select your gender
   Of the 84 respondents, 45 (53.6%) were male and 39 (46.4%) were female.

2. Please select your age range
   ![Pie chart showing age distribution](image)
   Of the 84 respondents, the biggest group were aged between 21-30 (51 people), the smallest group were aged more than 40 (only 7 people).

3. Is English your first language?
   Of the 84 respondents, more than 93% (78 people) had a first language other than English, and only 6 respondents had English as their first language.

4. Which type of institution do you currently study at?
A majority (51 respondents) were university students, 25 respondents were studying at polytechnic/institute of technology. In addition, a small number (8) had graduated and/or were working. (see appendix 1 figure 1a) put back

5. Which major do you currently study?
Of the 84 respondents, more than half (44) were computing students, more than a quarter (22) were business students, and smaller numbers studied engineering (7), science (2), arts (1) or another major (8).

The purpose of questions 1 to 5 was to gather basic information from respondents such as gender, age range, first language, major studied and tertiary provider type. The results obtained show that a majority of respondents are male; a majority of respondents are aged between 21 and 30; a majority of respondents have a first language other than English; a majority of respondents are computing majors and a majority of respondents are studying in university. These results can be expected given the nature of the two target groups of respondents in the research. One was from Unitec Masters in Computing (including past students) and other was students currently studying at another university or polytechnic.

6. Please specify the general features you expect in an E-learning system?

![Figure 4.1.1d](image)

Figure 4.1.1d  Expected features of E-Learning (n=84)

More than three quarters of respondents expected that an E-learning system should be easy to use and a similar number thought E-Learning should be able to distribute information and resources. As for the items of flexibility, open source, personal learning environment and co-operative working, the number of respondents are 55, 48, 48 and 46 respectively.

7. Please rate your Computer and Internet Experience (from 1, which means "no
experience" to seven, which means "highly experienced")

Figure 4.1.1e   IT experience of respondents

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using Web browsers</td>
<td>6.05</td>
</tr>
<tr>
<td>Using e-mail</td>
<td>6.20</td>
</tr>
<tr>
<td>Using MS Office packages</td>
<td>5.37</td>
</tr>
<tr>
<td>Coding Web pages</td>
<td>3.31</td>
</tr>
</tbody>
</table>

Table 4.1.1-1   Average scores of IT experience (n=84)

Using E-mail has the highest average score (46 respondents gave the 7 score for their experience). The second highest average score was for using web browsers (41 respondents give the 7 score for their experience). The average score for using MS Office is 5.37 (27 respondents gave the 7 score for their experience) but the score for coding web pages was much lower, only 3.31 (only 9 respondents gave the 7 score for their experience).

8. Please select the E-learning style you prefer
Most respondents preferred the E-learning style to combine student-centered and teacher-centered approaches.

9. Please rate the applications below as being useful in E-learning

<table>
<thead>
<tr>
<th>Application</th>
<th>Not used</th>
<th>Very poor</th>
<th>Poor</th>
<th>Ok</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>16</td>
<td>1</td>
<td>2</td>
<td>37</td>
<td>14</td>
<td>5</td>
</tr>
<tr>
<td>Facebook</td>
<td>14</td>
<td>3</td>
<td>4</td>
<td>15</td>
<td>30</td>
<td>8</td>
</tr>
<tr>
<td>Google apps</td>
<td>6</td>
<td>0</td>
<td>4</td>
<td>19</td>
<td>33</td>
<td>12</td>
</tr>
<tr>
<td>Moodle</td>
<td>31</td>
<td>0</td>
<td>4</td>
<td>23</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>MSN</td>
<td>14</td>
<td>3</td>
<td>3</td>
<td>37</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Myspace</td>
<td>36</td>
<td>1</td>
<td>5</td>
<td>18</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Second Life</td>
<td>49</td>
<td>0</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>YouTube</td>
<td>15</td>
<td>0</td>
<td>2</td>
<td>19</td>
<td>29</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 4.1.1-2 Ratings of learning systems and Web 2.0 applications (n=75, 9 participants did not answer the question)

The applications rated as most useful were Google, YouTube, Blackboard, Facebook and MSN. Myspace is declining in popularity worldwide and Second Life is not widely used.

10. Please rate the technologies below as being useful in E-learning
Table 4.1.1-3 Ratings of Web 2.0 technologies (n=75, 9 participants did not answer the question)

These three Web 2.0 technologies are rated positively by 80% to 90% of respondents (Positive % = Total number of respondents (OK + Good + Excellent)/75).

11. How many hours per week do you spend on the applications in question 9?

Figure 4.1.1 g  Time consumed
More than two thirds of participants spend 10 or more hours on those applications.

12. Please select the features that you think each of the following applications have.
Table 4.1.1-4 Features of learning systems and Web 2.0 applications  (n=75, 9 participants did not answer the question)

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative learning</th>
<th>Free of cost</th>
<th>Concurrency control</th>
<th>Virtualized environment</th>
<th>Personalized environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>17</td>
<td>41</td>
<td>28</td>
<td>14</td>
<td>9</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Facebook</td>
<td>13</td>
<td>39</td>
<td>35</td>
<td>50</td>
<td>8</td>
<td>21</td>
<td>40</td>
</tr>
<tr>
<td>Google apps</td>
<td>11</td>
<td>44</td>
<td>36</td>
<td>49</td>
<td>32</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>Moodle</td>
<td>39</td>
<td>22</td>
<td>22</td>
<td>16</td>
<td>10</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>MSN</td>
<td>16</td>
<td>35</td>
<td>29</td>
<td>46</td>
<td>10</td>
<td>10</td>
<td>35</td>
</tr>
<tr>
<td>Myspace</td>
<td>41</td>
<td>20</td>
<td>16</td>
<td>25</td>
<td>6</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>Second life</td>
<td>51</td>
<td>12</td>
<td>11</td>
<td>14</td>
<td>2</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>YouTube</td>
<td>11</td>
<td>46</td>
<td>26</td>
<td>52</td>
<td>8</td>
<td>33</td>
<td>20</td>
</tr>
</tbody>
</table>

Clear majorities of respondents believed that YouTube, Google Applications, Blackboard and Facebook were easy to use and that YouTube, Facebook, Google applications and MSN were free of cost. Nearly half of the respondents thought Facebook and Google applications were good for co-operative learning and 32 respondents believed Google applications had a good capability in concurrency control. Facebook had the most respondents (40) for personalized environment, and YouTube had the most respondents (33) for virtualized environment. Myspace is declining in popularity worldwide. Second Life and Moodle are not widely used.

13. Please select the features that you think the each of the following technologies have.

Table 4.1.1-5 Features of Web 2.0 technologies (n=75, 9 participants did not answer the question)

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative learning</th>
<th>Free of cost</th>
<th>Concurrency control</th>
<th>Virtualized environment</th>
<th>Personalized environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogging</td>
<td>13</td>
<td>42</td>
<td>37</td>
<td>47</td>
<td>9</td>
<td>10</td>
<td>43</td>
</tr>
<tr>
<td>Forum</td>
<td>7</td>
<td>44</td>
<td>47</td>
<td>47</td>
<td>13</td>
<td>17</td>
<td>27</td>
</tr>
<tr>
<td>Wiki</td>
<td>7</td>
<td>51</td>
<td>40</td>
<td>55</td>
<td>15</td>
<td>17</td>
<td>30</td>
</tr>
</tbody>
</table>

Clear majorities of respondents believed that Blogging, Forum and Wiki were easy to use and free of cost, that Forum and Wiki were good for co-operative learning and that Blogging is able to provide personalized environments. Nearly half considered that Blogging was good for co-operative learning. However, only minorities considered that these three technologies were able to provide concurrency control and virtualized environments.

14. Please select the features of the following applications below that you do not like.
Table 4.1.1-6 Disadvantages of learning systems and Web 2.0 applications (n=75, 9 participants did not answer the question)

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with common use application such as MS Office</th>
<th>Not have enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>21</td>
<td>7</td>
<td>14</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>Facebook</td>
<td>14</td>
<td>34</td>
<td>28</td>
<td>26</td>
<td>34</td>
</tr>
<tr>
<td>Google apps</td>
<td>11</td>
<td>21</td>
<td>28</td>
<td>32</td>
<td>24</td>
</tr>
<tr>
<td>Moodle</td>
<td>42</td>
<td>5</td>
<td>9</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>MSN</td>
<td>15</td>
<td>25</td>
<td>30</td>
<td>20</td>
<td>38</td>
</tr>
<tr>
<td>Myspace</td>
<td>43</td>
<td>12</td>
<td>19</td>
<td>18</td>
<td>22</td>
</tr>
<tr>
<td>Second life</td>
<td>58</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>YouTube</td>
<td>16</td>
<td>25</td>
<td>23</td>
<td>26</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 4.1.1-7 Disadvantages of Web 2.0 technology rating (n=75, 9 participants did not answer the question)

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with common use application such as MS Office</th>
<th>Not have enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogging</td>
<td>15</td>
<td>33</td>
<td>29</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Forum</td>
<td>10</td>
<td>32</td>
<td>34</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>Wiki</td>
<td>14</td>
<td>30</td>
<td>34</td>
<td>20</td>
<td>26</td>
</tr>
</tbody>
</table>

Substantial minorities of respondents believed that it is difficult to control information in Facebook, MSN and YouTube, that Facebook, Google applications and MSN lack technical support, that Blackboard, Facebook, Google applications and YouTube are not compatible with common use applications, and that Facebook, MSN and YouTube do not have enough functions for academic use. Clear majorities of respondents had not experienced Moodle, Myspace and Second Life.

15. Please select the features of the following technologies below that you do not like.

16. Please rate the usefulness of the main functions related to assessment. (From 1 "useless" to 5 "very useful").
Figure 4.1.1h Main functions of assessment

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment &amp; Assignment submission</td>
<td>4.26</td>
</tr>
<tr>
<td>Grade book</td>
<td>3.76</td>
</tr>
<tr>
<td>Online testing</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Table 4.1.1-8 Average scores of online testing management functions (n=74, 10 participant did not answer the question)

Assessment and Assignment submissions had the highest average score (4.26). The other functions “grade book” and “online testing” were also rated highly (3.76 and 3.89 respectively).

17. Please rate the usefulness of the main functions related to Course management. (From 1 "useless" to 5 "very useful").
Course materials management was considered the most important (average score 4.23), followed by course information searching (average score 4.16), course classification (3.99), and course evaluation and development (3.89). Course deletion had the lowest rating, just 3.28. However, based on the results obtained, participants considered that all items were useful.

18. Please rate the usefulness of the main functions related to Communication management. (From 1 "useless" to 5 "very useful").
Figure 4.1.1 j Main functions of communication management

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Book</td>
<td>3.56</td>
</tr>
<tr>
<td>Email</td>
<td>4.36</td>
</tr>
<tr>
<td>Mobility</td>
<td>3.76</td>
</tr>
<tr>
<td>Online chat room</td>
<td>3.53</td>
</tr>
<tr>
<td>Online message</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Table 4.1.1-10 Average scores of communication management functions (n=74, 10 respondents did not answer the question)

Sending Email was clearly the most popular function (average score 4.36). The other functions in this section were also rated highly (from 3.53 to 3.8).

19. Please rate the usefulness of the main functions related to co-operative working. (From 1 "useless" to 5 "very useful").
Figure 4.1.1k Main functions of co-operation management

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concurrency control editing</td>
<td>3.83</td>
</tr>
<tr>
<td>Group page &amp; community</td>
<td>3.97</td>
</tr>
<tr>
<td>Mobility</td>
<td>3.81</td>
</tr>
<tr>
<td>Online chat room</td>
<td>3.58</td>
</tr>
<tr>
<td>Online message</td>
<td>3.79</td>
</tr>
<tr>
<td>Resource distribution &amp; sharing</td>
<td>4.33</td>
</tr>
</tbody>
</table>

Table 4.1.1-11 Average scores of co-operation management functions (n=74, 10 respondents did not answer the question)

All the items were rated as very useful (average scores higher than 3.5), with resource distribution and sharing considered the most useful function (average score 4.33).

20. Please rate the usefulness of the main functions related to file management. (from 1 "useless" to 5 "very useful").
Table 4.1.1-12 Average scores of file management functions (n=74, 10 respondents did not answer the question)

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>File uploading</td>
<td>4.22</td>
</tr>
<tr>
<td>File downloading</td>
<td>4.26</td>
</tr>
<tr>
<td>File type transfer</td>
<td>3.85</td>
</tr>
<tr>
<td>File classification</td>
<td>3.84</td>
</tr>
<tr>
<td>File sharing</td>
<td>4.26</td>
</tr>
<tr>
<td>File deletion</td>
<td>3.53</td>
</tr>
</tbody>
</table>

All the items were rated as very useful (average scores higher than 3.5). 39 respondents gave the top score (5) to file sharing and 32 respondents gave the top score (5) to file uploading (see appendix 1, figure 1a).

21. Please rate the usefulness of the main functions related to Learning management. (from 1 "useless" to 5 "very useful").
Table 4.1.1-13 Average scores of learning management functions (n=74, 10 participant did not answer the question)

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning resource management</td>
<td>4.03</td>
</tr>
<tr>
<td>Learning resource searching</td>
<td>4.3</td>
</tr>
<tr>
<td>Learning resource distribution &amp; sharing</td>
<td>4.29</td>
</tr>
<tr>
<td>Online chat room</td>
<td>3.58</td>
</tr>
<tr>
<td>Online message</td>
<td>3.65</td>
</tr>
<tr>
<td>Personal learning environment</td>
<td>4.14</td>
</tr>
</tbody>
</table>

All the items were rated as very useful (average scores higher than 3.5). 39 respondents gave the top rating score (5) to learning resource distribution and sharing and 36 respondents gave personal learning environment the top score, and about learning resource searching, 37 respondents gave the top rating score (see appendix 1, figure 1b).
4.1.2 Description of Interview data

Six Unitec lecturers and Unitec six students volunteered to take the interview. Most of them had experience with using Blackboard, Moodle and frequently used Web 2.0 applications.

1. In case of E-Learning 2.0, which E-learning types are suitable? (student-centric, Teacher-centric, others).

![Figure 4.1.2-a E-learning style](image)

Student-centric learning has been preferred by 10 interviewees; only 2 interviewees thought that teacher-centric is a suitable E-Learning style.

2. What the features of Blackboard and Moodle are used for e-learning in your courses?

![Figure 4.1.2-b Features of Blackboard and Moodle](image)

Sending e-mail, downloading lecture notes and submitting assignments were the most
widely used features of BlackBoard and Moodle. Other features, such as viewing course grade, providing URLs, using chat rooms and online testing, were mentioned only by small numbers of interviewees. All the features in the figure 4.1.2b above have been identified by the interviewees.

3. What features are the most useful?

![The most useful features of Blackboard and Moodle (identified by the interviewees)](image)

Downloading Lecturer notes was considered by a majority of the interviewees as the most useful function of Blackboard and Moodle. Other features, such as sending emails, online testing, viewing course grades, submitting assignments and using discussion board, were mentioned only by small numbers of interviewees.

4. Which web 2.0 applications would you like to use for e-learning and what for?

![Preferred web 2.0 applications (identified by the interviewees)](image)

Google applications and instant messaging (MSN and/or QQ) were relatively popular
applications among the interviewees. Other applications, such as Facebook, Forum, YouTube, Blog and Skype, were mentioned only by small numbers of interviewees. The purposes for which these applications would be used are shown below by category (table 4.1.2-1)

<table>
<thead>
<tr>
<th>Name of web 2.0 applications</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSN</td>
<td>Communicate with others</td>
</tr>
<tr>
<td>QQ</td>
<td>Communicate with others</td>
</tr>
<tr>
<td>Skype</td>
<td>Communicate with others</td>
</tr>
<tr>
<td>Facebook</td>
<td>Communicate with a community, share solutions, ideas, feelings , thinking</td>
</tr>
<tr>
<td>Forum</td>
<td>Get feedback or comments from others</td>
</tr>
<tr>
<td>Blog</td>
<td>Get feedback or comments from others</td>
</tr>
<tr>
<td>Google applications</td>
<td>Share documents</td>
</tr>
<tr>
<td>YouTube</td>
<td>Download, upload and share video files</td>
</tr>
</tbody>
</table>

Table 4.1.2-1 Web 2.0 applications and purpose (identified by the interviewee)

5. What are the advantages of using Blackboard and Moodle?

Blackboard

![](figure)

Figure 4.1.2-e1 Advantages of using Blackboard (identified by the interviewees)

Availability (24 hours and 7 days) and standard layout were the most widely identified advantages. Other advantages, such as easy to use and communication channel, were mentioned only by small numbers of interviewees.

Moodle
Six interviewees had not experienced Moodle; flexibility and personal learning environment were each mentioned by four interviewees.

(All the advantages in figures 4.1.2 e1 and e2 above have been identified by the interviewees).

6. What are the disadvantages of using Blackboard and Moodle?

Blackboard
Moodle

Expensive and rigid layout were the most widely identified disadvantages of Blackboard. However, the most widely perceived disadvantage of Moodle was that it was too flexible and personal. One interviewee thought that Blackboard and Moodle had the same disadvantages of depending on IT and encouraging students stay at home.

(All the disadvantages in figures 4.1.2 f1 and f2 above have been identified by the interviewees).

7. How can Web 2.0 applications improve E-learning? What are they?

Figure 4.1.2-g1 How web 2.0 can improve E-learning (identified by the interviewees)
(4 interviewees did not answer this question)
Four interviewees considered that, no matter how good web 2.0 applications are, it is vital that users must be familiar with them. Five interviewees believed web 2.0 could improve group work, and two interviewees considered that Web 2.0 could help in sharing and contributing information.

![Figure 4.1.2-g2](image)

**Figure 4.1.2-g2** How web 2.0 can improve E-learning (identified by the interviewee)

Four interviewees believed Google applications could improve group work, five interviewees thought Facebook was good for sharing information with others and three interviewees considered that MSN and/or QQ would improve communication.

The web 2.0 applications in figure 4.1.2 g2 are identified by the interviewees.

8. What are the new features do you expect in the learning system? And the related reasons?

![Figure 4.1.2-h1](image)

**Figure 4.1.2-h1** Expected features of E-learning (identified by the interviewees) (4 interviewees did not answer this question)

Online video and audio course was mentioned by six interviewees, and five mentioned collaborative working. There was one response each for the features “easy
to use”, “mobility”, “improve security”, “online testing”, “search learning resource” and “online real time translation”.

The features of learning system in figure 1.2 h1 are identified by the interviewees.

![Bar chart showing features identified by interviewees](image)

Figure 4.1.2-h2 Reasons for E-Learning new features (identified by the interviewee)
(4 interviewees did not answer this question)

The following table presents the relationship between features and reasons.

<table>
<thead>
<tr>
<th>Number of interviewees</th>
<th>Features</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>online video &amp; audio course</td>
<td>Convenience, saving cost, save time</td>
</tr>
<tr>
<td>4</td>
<td>“mobility”, “searching learning resource”, “online testing” and “online real time translation”</td>
<td>Availability</td>
</tr>
<tr>
<td>4</td>
<td>“Mobility”, “searching learning resource”, “online testing” and “online real time translation”</td>
<td>Personalize</td>
</tr>
<tr>
<td>2</td>
<td>“ease of use” and “collaborative working”</td>
<td>Improve the efficiency of study</td>
</tr>
<tr>
<td>2</td>
<td>“ease of use” and “security”</td>
<td>Basic system requirement</td>
</tr>
</tbody>
</table>

Table 4.1.2-2 features and reasons

4.2 Data analysis and discussion

In this section, the data gathered from the online survey and interviews are analyzed, discussed and related to the literature.
4.2.1 Online survey general analysis and discussion

Question 6

The purpose of question 6 was to identify the general features of an E-Learning system of which the respondents had some knowledge. The results showed that 80% of respondents identified ‘ease of use’ which supports the view of Keenan and Yao-kuei (2007, p. 225) that “no matter how well the e-learning system integrates various media and allows for interactivity for each other”, ease of use will be the first factor that is considered by users. The other results obtained in this study support the conclusion of Hassan (2007) who found that key success factors of E-learning are flexibility, personal environment, co-operative working and information distribution.

Question 7

The results of question 7 are very interesting. It seems that even the students who are currently studying a computing degree have limited experience of coding (programming), whereas most respondents were experienced with using web browser, email and MS Office. The likely reason is that the majority of respondents were not from a software engineering major. It is noticeable that the average score for each item in question 7 for Unitec respondents is higher than for respondents contacted via Facebook. The reason for this is that is all the Unitec respondents are computing students and only one third of the Facebook respondents are computing students. It is to be expected that the general IT technical experience of computing students is greater than other students.
Figure 4.2.1a IT experience of respondents contacted via Facebook

<table>
<thead>
<tr>
<th>Items</th>
<th>Average score (Facebook)</th>
<th>Average score (Unitec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using Web browsers</td>
<td>5.83</td>
<td>6.27</td>
</tr>
<tr>
<td>Using e-mail</td>
<td>6.04</td>
<td>6.33</td>
</tr>
<tr>
<td>Using MS Office</td>
<td>5.33</td>
<td>5.83</td>
</tr>
<tr>
<td>Coding Web pages</td>
<td>2.71</td>
<td>3.83</td>
</tr>
</tbody>
</table>

Table 4.2.1a IT Skill ranking (n=84)

**Question 8**

Results for question 8 show that most respondents like to combine traditional teaching and student self learning styles. This result is supported by the work of U and Corner (2009) and Su, Yang, Huwang, Zhang (2010), who pointed out that even under E-learning 2.0 the teacher needs to be involved and to provide support to students.

**Questions 9 and 10**

The purpose of questions 9 and 10 was to obtain the respondents’ views as to which web 2.0 applications and technologies are useful in E-learning. The result is very clear, except for Second Life and MySpace, most respondents believe Web 2.0 applications and technologies are suitable for E-learning. The reason for this is that current
learning systems, for example Blackboard, have been used for a long time, so students are familiar with the layout, and the function modules used. For Moodle, because it is similar to Blackboard, there are no issues generated when the students start to use such a system. This result was aligned with that obtained by Machado and Tao (2007). The rest of the web 2.0 applications such as FaceBook, YouTube, MSN, Google applications, WiKi, Forum and Blog, have high popularity as well as the high degree of satisfaction among respondents. Therefore, they are considered as suitable applications for E-learning.

**Question 11**

The purpose of question 11 was to measure the time participants spend on these web 2.0 applications. Because these applications or learning systems are very popular (Khe, 2011; Machado & Tao, 2010; Hwang, Wu, & Chen, 2008; Ruan & Cai, 2010) and (NingShen, Khalifa, 2010) the majority of people like to spend 10 or more hours per week on these applications. According to NingShen and Khalifa (2010, p.1080), the average Facebook user has 100 friends on the site, and users (worldwide) spend more than 3 billion minutes on Facebook each day.

**Questions 12 and 13**

The purpose of Questions 12 and 13 was to identify respondents’ perceptions of the features of learning systems, web 2.0 applications and technologies.

Question 12 focuses on the features of Web 2.0 applications such as Facebook, YouTube, MSN, Myspace, Second Life and compares these to two learning systems, Blackboard and Moodle. This result is in alignment with the research of Chen (2009); Duffy (2010); Khe (2011); Wan (2010) and Machado and Tao (2007). The following table summarizes those articles:
Question 13 mentions three Web 2.0 technologies, Blog, Forum and Wiki. The results from the online survey are supported by Chen (2009), Duffy (2010), Wan (2010); Wheeler et al (2008), and Huang-Ling (2009) all of whom report that Blog, Forum and Wiki are Web 2.0 technologies which have features of “open resource”, “ease of use”, “co-operative working” and “personal environment”. These applications are capable of optimizing the learning process which then leads to an effective learning environment for students.

The following table summarizes those articles:

<table>
<thead>
<tr>
<th>Author</th>
<th>Learning system or Web 2.0 applications</th>
<th>Good Features</th>
</tr>
</thead>
</table>
| Chen (2009)   | Google applications, MSN               | ● Ease of use  
 ● Free of cost  
 ● Personal learning environment  
 ● Co-operative working  
 ● Concurrency editing |
| Wan (2010)    | Google applications, YouTube, FaceBook | ● Ease of use  
 ● Free of cost  
 ● Personal learning environment  
 ● Co-operative working  
 ● Concurrency editing |
| Duffy (2010)  | YouTube, MSN                           | ● Ease of use  
 ● Free of cost  
 ● Personal learning environment  
 ● Co-operative working |
| Khe (2011)    | Facebook                               | ● Ease of use  
 ● Free of cost  
 ● Personal learning environment  
 ● Co-operative working |
| Machado & Tao (2007) | Blackboard & Moodle       | ● Ease of use  
 ● Personal learning environment |
Questions 14 and 15

Question 14 focuses on the “disliked” features of Web 2.0 applications such as Facebook, YouTube, MSN, Myspace, Secondlife and two learning systems, Blackboard and Moodle. The results are in alignment with those of McLean et al. (2007); Khe, (2011); Wheeler, et al. (2008); Dan (2009) and Machado and Tao (2007). The following table summarizes those articles:

<table>
<thead>
<tr>
<th>Author</th>
<th>Web 2.0 applications or learning system</th>
<th>Bad Features of Web 2.0</th>
</tr>
</thead>
</table>
| McLean et al. (2007)  | SNS(YouTube, Facebook), IM(MSN)        |  ● Hard to control information  
                          |                                                        |  ● Lack technical support                        |
| Khe (2011)            | FaceBook                               |  ● Hard to control information  
                          |                                                        |  ● Lack technical support                        |
| Dan (2009)            | Google apps                             |  ● Lack academic function  
                          |                                                        |  ● Not compatible with commonly used applications |
| Machado & Tao (2007)  | Blackboard and Moodle                   |  ● Lack academic function                                                            |

Note: SNS: Social network service, IM: instant message

Table 4.2.1d   Summary of articles that support results obtained

In addition, those results relate to the theory of “long tail” (Anderson, 2006). That means many people just focus on a few applications.
Question 15 considers the “disliked” features of Blog, Forum and Wiki. Many respondents mentioned “lack of technical support”, “difficulty to control information” and issues of compatibility with the commonly used applications. The reason is that Blog, WiKi and Forum are Web 2.0 technologies which are open source and have the feature of “sociality”. Consequently, those applications will lack technical support. Also, because of sociality, everyone contributes and shares the resource, which engenders communal information control. McLean et al. (2007, p. 175) state that: “The big problem of wikis and blogs is that they are vulnerable because of lack of authoritative control over their content”.

**Questions 16 to 21**

The purpose of questions 16 to 21 was to gather information about the functions that may be used in a learning system. E-learning systems consist of several sub-systems, like communication, learning, course management, co-operation management, testing, and file management.

The results were used to construct the three tier E-Learning Model (see section I) and are supported by the research of Li and Yu (2010); Liu, He, Wang, Dai (2010); I-Fan, Chen, Sun, Wible, and Kuo (2010) and Oliveira and Moreira (2010). The table below summarizes these articles.
Table 4.2.1e Summary of articles that support results obtained

Based on the analysis above, some requirements of E-learning system can be identified. These requirements are listed below:

- Ease of use
- The functions of co-operative working such as group page, chat room, file sharing and concurrency editing
- Online course and related functions such as learning material searching, uploading and downloading
- Online testing and related functions
4.2.2 Interview data analysis and discussion

Question 1

The purpose of the first interview question, like question 8 in the online survey, was to identify suitable E-Learning types. These results were similar to those of the survey: most users prefer the learning style of student – centric based but also noted the need for teacher support.

Questions 2 and 3

The purpose of interview questions 2 and 3 was to gather feedback on features currently used in e-learning systems, because no matter how good the functions or features of the system, “perceived usefulness and perceived satisfaction both contribute to the learners’ behavioral intention to use the e-learning system” (Shu-Sheng, 2008, p. 864). The results of questions 2 and 3 are consistent with the findings of Casagranda, Colazzo, Molinari, Tomasini and Villa (2011), who found that downloading course material is the most useful service that is identified by the learners. The majority of respondents identified the features of downloading lecturer notes and sending email as the most useful. Another important conclusion is that most respondents still maintain a web 1.0 concept, in other words, most people still focus on reading or watching information online, not creating new information. Three probable reasons are that traditional methods dominates the daily teaching process, current users are satisfied with using common functions and tend to ignore other functions, and system development companies may lack knowledge of new interactive facilities.

Question 4

The purpose of interview question 4 was to gather feedback about web 2.0 functions that respondents may use in a learning system. From the results obtained, the applications of instant message (IM) like MSN and QQ are most preferred by respondents. Levine (2010) states that MSN is one of the first three IM systems (another two are AIM and Yahoo Messenger). QQ is also mentioned because five respondents are Chinese, and QQ is the most popular application in China and has
about 350 million registered members (Heike, 2009). Google applications are mentioned by five interviewees who believe that Google applications are able to improve group work. This result is in agreement with Wang and Jin (2010), who found that Google applications could improve the quality of group work. The rest of the web 2.0 applications that have been mentioned in this question are Forum, Facebook, YouTube, Blog and Skype. These Web 2.0 applications have been widely used to share information, conduct group work and obtain feedback from other people.

Questions 5 and 6

Interview question 5 and 6, have been designed to identify good and bad features of using Blackboard and Moodle, and look for the evidence to support good features of these learning systems.

Ten respondents were positive about the “standard layout” of Blackboard. The results are supported by Weinman (2003), who pointed out that web layout is an important factor for web design, because of the impacts on accessibility and usability of the system. Another item that has been considered by most people is “stability”, because they all state that they can access Blackboard 24/7. Thus, this result identifies another factor of these E-learning systems, which is “availability”. The rest of the good features identified by respondents were “communication”, “ease of use” and “personal learning environment”. However, communication is not a good feature of Blackboard. The only communication tool on Blackboard is email. On the other hand, the negative opinions mentioned by the respondents are “expensive” and “rigid structure”, which is in agreement with the results obtained by Machado and Tao (2007).

As for Moodle, most interviewees identify the features of flexibility, personal learning environment and open source. However, these features may be the biggest problems for Moodle for learning. Moodle is too flexible so there is no standard layout in the system. This then becomes an issue for both lecturers and students. Also, because it is open source, there may be a lack of technical support. Half of the interview respondents declared that they had had no or limited experience with Moodle. Stephen (2010, p. 2) stated that “for any new technology, while there have been localized instances of successful implementations, overall the picture seems disappointing”.

Question 7

Interview question 7 was intended to gather information about interviewees’ experiences in using some specific web 2.0 applications. Five people stated that their experiences with web 2.0 applications were good, especially for group work, and they
gave the example of Google applications. This result matches that obtained by Chen (2009), who indicated that Google applications play an essential role in group work. Four interviewees identified human factors as important when using web 2.0 applications, and noted that teachers and students should be familiar with using these applications. Ebner (2007, p. 4) presented a formula (below) to describe E-learning 2.0.

\[
\text{E-Learning 2.0} = f (\text{E-Learning 1.0}, \text{Web 2.0}, \text{human factor})
\]

In his report, he pointed out that when web 2.0 applications are used in E-learning, human factors such as degree of acceptance, usage and proficiency are of primary importance. Topcu et al. (2010) indicated clearly that web 2.0 should focus on the users, so again, human factors must be considered.

Only two participants identified “share and contribute information” as important. According to these people, Facebook as well as Instant message (MSN, QQ) are good for information sharing and communicating. Whilst this point has only been identified by two participants, it is an important feature of Web 2.0, and Fovet (2009), explored the impact of Facebook for learning.

Responses to this question show that integrating web 2.0 applications such as Google applications, QQ and WiKi into a learning system can be very positive for the users. Because web 2.0 applications are capable of an optimized and enhanced learning process, consequentially, the traditional learning style will be changed. According to He and Wang (2010, p. 1124), one result could be “changing the learners' role from passive to active learners, allowing them to better create and retain knowledge.”

**Question 8**

The purpose of interview question 8 was to identify the features that users expect in a learning system. According to the result, most respondents expect any new learning system to include online video and audio course. The reason for this may be that “video has become one of the primary sources” on the internet (Mei, Hua, & Li, 2009, p.1866). This opinion is very similar to Benevenuto et al (2009, p. 301), who pointed out that “Video pervades the Internet and supports new types of interaction among users, including video forums, video chats, video mail, and video blogs.” Recently, Web 2.0 applications, for instance YouTube and Facebook, have been able to support online video which has become popular with users. Baluja, Seth, Sivakumar, Jing, Yagnik, Kumar, Ravichandran and Aly (2008, p. 895) state that there are “over 45,000,000 videos in the YouTube repository, and that the collection is growing at an astounding rate of seven hours of video being uploaded every minute”. Carr-Chellman and Duchastel (2000) predicted that online video and audio courses would be beneficial and popular in the future.
Another main item mentioned by respondents is “improving collaborative working”. This result suggests two things, one is that current learning systems lack the function of “collaborative working” and another is that interviewees expected learning systems to have this function. “Improving collaborative working” is one of the impacts of Web 2.0 on learning. Many web 2.0 applications such as WiKi (Duffy, 2007; Wheeler et al, 2008), Google applications (Chen, 2009), Blog (Chen, 2009; Su et al, 2010) are able to meet this expectation.

Another important feature mentioned by a respondent is mobile learning support. However, this feature has limitations, for instance, it requires using a smartphone. A smartphone is a type of mobile phone that offers advanced capabilities (Lian, 2008), such as PC functionalities, internet access, email (send and receive), browsing videos and pictures, and reading documents (.pdf, .doc). iPhone four generation is a good example of a smartphone.

4.2.3 Data analysis and discussion

In the section, in order to obtain a deeper understanding of the findings, the respondents to the online survey are clustered into four categories based on their age, gender, major studied and first language. The results for each category are presented, analysed and discussed. There were only one arts major and two science majors, so they will be ignored throughout this section.

In this study a major limitation is that the majority of participants had English as a second language. Compared with international students, local people are the main users of the learning system. These different user groups have different requirements and also may hold different views of the learning system. Another limitation is that people whose first language is not English may have different experience with web 2.0 applications. One example is that five of the Chinese interviewees preferred to use QQ rather than MSN. Moreover, one of these interviewees had no experience with Facebook, and two of those interviewees had no experience with YouTube. But social networks such as Facebook, YouTube or Twitter are quite popular with local people who have English as their first language.

Q6 E-learning features expected

For this question, respondents could select multiple responses and the percentages indicate the proportion of respondents. When all responses are combined, the most widely expected features (in order) are “ease of use” (80%), “information and resource distribution” (77%), “flexibility” (65%), “open source” (57%), “personalized
learning environment” (57%), and “co-operative working” (55%).

(Figure 4.2.3-a1 E-Learning features of four categories-age, n=84)

There are small variations across the age groups: those aged 21 to 40 mention “information and resource distribution” slightly more often than “ease of use” and those aged more than 30 mention “co-operative working” and “personalized learning environment” more often than “open source”.

(Figure 4.2.3-a2 E-Learning features of four categories-major, n=73)

There are small variations across the majors: business majors mention “open source” slightly more often than “personalized learning environment”, computing majors mention “co-operative working” and “personalized learning environment” more often
than “open source” and engineering majors mention “open source” more often than “flexibility” and mention “co-operative working” more often than “personalized learning environment”.

![Figure 4.2.3-a3 E-Learning features of four categories-gender, n=84)](image)

There are small variations across the genders: males mention “information and resource distribution” more often than “ease of use” and mention “co-operative working” more often than “open source”, and females mention “open source” more often than “flexibility”.

![Figure 4.2.3-a4 E-Learning features of four categories- language, n=82)](image)
The six students who have English as their first language mention “co-operative working” more often than “flexibility”, “open source” or “personalized learning environment”, and mention “personalized learning environment” more often than “open source”.

Q 7 General IT experiences

In this question, the IT experiences of different groups were explored. When all responses are combined, the experience ratings (in order) are “using Email” (6.20), “using web browsers” (6.05), “using MS Office package” (5.37), “coding web pages” (3.31).

![Bar chart showing IT skills by age group](image1)

(Figure 4.2.3-b1 IT Skills of four categories- age, N=84)

There are some variations across the age groups: those aged more than 40 rated “using web browsers” ahead of “using Email” (they also had the highest rating for “coding web pages”). Those aged 10 to 30 rated their experiences of “using Email” and “using web browsers” significantly higher than those aged more than 30.

![Bar chart showing IT skills by major](image2)

(Figure 4.2.3-b2 IT Skills of four categories- major, N=72, 11 respondents are another major)
Computing majors have the highest ratings, particularly for “coding web pages”.

![Graph showing IT skills by gender](image1)

Males rated their experiences of “using MS Office packages” and “coding web pages” significantly higher. This result relates to previous research conducted by Pedersen and Macafee (2007) who found that males were good at handling IT technology.

![Graph showing IT skills by language](image2)

People who have English as their first language have significantly higher ratings, particularly for “coding web pages” (the highest for any category but still well below the ratings for the other three activities).
Q8 E-learning style

For this question, the percentages indicate the proportion of respondents. When all responses are combined, the learning style preferences (in reverse order) are teacher-centered (2.7%), student-centered (33.3%), and both (64.0%).

(Figure 4.2.3-c1 E-Learning style of four categories-age, n=75, 9 people did not answer this question)

Those aged 10 to 20 strongly prefer student-centered learning, but the other age groups prefer to combine teacher-centered and student-centered learning. A small minority of those aged 21 to 30 were the only respondents to prefer teacher-centered learning.
Business and computing majors prefer to combine teacher-centered and student-centered learning, but engineering majors strongly prefer student-centered learning. A small minority of business majors were the only respondents to prefer teacher-centered learning.

More males than females like to combine teacher-centered and student-centered learning.
All six respondents who have English as their first language and the majority of those who do not have English as their first language prefer to combine student-centered and teacher-centered learning. However, 34.7% those people who do not have English as their first language prefer student-centric learning.

Q9 The usefulness of E-Learning systems and Web 2.0 applications

For this question, the percentages indicate the proportion of respondents.
Table 4.2.3-1a  Usefulness of Blackboard

Large majorities of males (76%) and females (74%) thought Blackboard is useful.

None of those aged 10 to 20 have any experience of Blackboard. Large majorities of the other age groups thought Blackboard is useful.

Large majorities of business and computing majors thought Blackboard is useful. Most engineering majors have not experienced Blackboard.

All those who have English as their first language have experienced Blackboard but 22% of those who do not have English as their first language have not experienced Blackboard. Large majorities of respondents of both groups consider Blackboard is useful.
Clear majorities of males (64%) and females (79%) thought Facebook is useful. However, more males than females have not experienced Facebook.

Clear majorities of respondents aged 10 to 40 thought Facebook is useful. However 14% of respondents aged more than 40 thought Facebook is poor and another 43% have not used it.

Clear majorities of business, computing and engineering majors thought Facebook is useful.

A large majority of those who do not have English as their first language consider Facebook is useful. But people who have English as their first language are evenly divided between those who have not used Facebook, those who think it is poor and those who think it is OK.

### Table 4.2.3-1b Usefulness of Facebook

<table>
<thead>
<tr>
<th>Gender</th>
<th>Not used</th>
<th>Very Poor</th>
<th>Poor</th>
<th>OK</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>22%</td>
<td>6%</td>
<td>8%</td>
<td>17%</td>
<td>39%</td>
<td>8%</td>
</tr>
<tr>
<td>Female</td>
<td>16%</td>
<td>3%</td>
<td>3%</td>
<td>24%</td>
<td>42%</td>
<td>13%</td>
</tr>
<tr>
<td>Age range</td>
<td></td>
<td></td>
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Table 4.2.3-1c  Usefulness of Google applications

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<td>29%</td>
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<td>0%</td>
<td>4%</td>
<td>27%</td>
<td>44%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Large majorities of males (84%) and females (89%) thought Google applications are useful.

Clear majorities of respondents in each age group thought Google applications are useful. However, 43% of respondents aged 10 to 20 have not used them.

Clear majorities of business, computing and engineering majors thought Google applications are useful.

A large majority of those who do not have English as their first language consider Google applications are useful. However, 33% of those who have English as their first language consider that Google applications are poor.
Table 4.2.3-1d  Usefulness of Moodle

More males (59%) than females (48%) thought Moodle is useful. However, more females than males have not experienced Moodle.

Clear majorities of those aged 21 to 30 and those aged 31 to 40 thought Moodle is useful. However, 86% of those aged 10 to 20 and 57% of those aged more than 40 have not experienced Moodle.

A clear majority of computing majors thought Moodle is useful. However, 58% of business majors and 71% of engineering majors have not experienced Moodle.

Majorities of both language groups thought Moodle is useful. However, 33% of those who have English as their first language and 42% of those who do not have English as their first language have not experienced Moodle.
Clear majorities of males (66%) and females (78%) thought MSN is useful. However, more males than females have not experienced MSN.

The 10 to 20 age group was divided between those who thought MSN is useful (50%), those who have not used it (17%) and those who thought it is very poor (33%). Clear majorities of the other age groups thought MSN is useful.

Clear majorities of business, computing and engineering majors and both language groups thought MSN is useful, probably because instant message systems such as MSN have the features of “instantaneity, speed, effectiveness and low cost” (Hwang et al. 2008). However, 33% of those who have English as their first language have not experienced MSN.
Table 4.2.3-1f  Usefulness of Myspace

Similar percentages of males (44%) and females (42%) thought Myspace is useful. However, more females than males have not experienced Myspace.

Around half of those aged 21 to 40 consider Myspace is useful. However, 86% of those aged more than 40 and of those aged 10 to 20 have not experienced Myspace.

Around half of business and computing majors thought Myspace is useful. However, 71% of engineering majors have not experienced Myspace.

Two thirds of those who have English as their first language have not experienced Myspace, the other third thought it is poor. Nearly half of those who do not have English as their first language have not experienced Myspace; a similar number thought it is useful.
Table 4.2.3-1g  Usefulness of Second Life

At least half of every group do not have any experience of Second Life. Significant number of males, those aged 21 to 40, business majors and those who have English as their first language thought Second Life is poor.

Based on the research of Li (2010); Ruan and Deng (2009); Maged, Kamel, Lee and Wheeler (2007) and Park, Shin, Cui and Hwang (2008), Second Life has been widely acknowledged as a model of participatory Web 2.0 and is considered as one of the ideal applications that can be adopted for academic purposes. So, why has it been seldom used among the respondents in this research even in the biggest groups, for instance those aged 21 to 30 who are computing majors? The likely reason for this is that Second Life has several constraints when people use it. For instance, it depends on the bandwidth of the network and the performance of external devices (speaker, monitor and micro-phone). Besides, to manipulate Avatars or other functions in the system requires technical expertise with Second Life. Therefore, compared with another 2D application, Second Life is more complicated. As a result, people need to spend more time on learning how to use Second Life, especially people who do not have any 3D experience (Li, 2010).
Clear majorities of every group thought YouTube was useful, however 42% of business majors, 29% of those aged more than 40 and 29% of females have not experienced YouTube. The last finding is supported by Molyneaux, O'Donnell, Gibson and Singer (2008) who pointed out that there were more male users on YouTube.

**Q 10 The usefulness of Web 2.0 technologies**

For this question, the percentages indicate the proportion of respondents.
In every group, clear majorities of those who had experience of Blogging thought it is useful. However 29% of those aged 10 to 20 and of engineering majors had no experience of Blogging and 28% of those groups thought it is poor.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Not used</th>
<th>Very Poor</th>
<th>Poor</th>
<th>OK</th>
<th>Good</th>
<th>Excellent</th>
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<tbody>
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<td>28%</td>
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<td>19%</td>
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<tr>
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<td>0%</td>
<td>22%</td>
<td>11%</td>
<td>33%</td>
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<table>
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<th>Good</th>
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<td>16%</td>
<td>61%</td>
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</tr>
<tr>
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<td>0%</td>
<td>14%</td>
<td>57%</td>
<td>14%</td>
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</table>

<table>
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<td>11%</td>
<td>0%</td>
<td>0%</td>
<td>18%</td>
<td>52%</td>
<td>18%</td>
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</tbody>
</table>

Table 4.2.3-j  Usefulness of Forum

Clear majorities of every group thought Forum is useful, however 33% of females and 29% of those aged more than 40 have not experienced Forum.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Not used</th>
<th>Very Poor</th>
<th>Poor</th>
<th>OK</th>
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<th>Excellent</th>
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<td>3%</td>
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<td>54%</td>
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<td>14%</td>
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<tr>
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<td>43%</td>
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<td>54%</td>
<td>21%</td>
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</tbody>
</table>

Table 4.2.3-k  Usefulness of WiKi

Clear majorities of every group thought WiKi is useful, however 31% of those aged 31 to 40 have not experienced WiKi.
Q11. Time spend on the applications

For this question, the percentages indicate the proportion of respondents.

(Figure 4.2.3-e1 Time of using web 2.0 applications-age, n=75, 9 respondents did not answer this question)

(Figure 4.2.3-e2 Time of using web 2.0 applications-gender, n=75, 9 respondents did not answer this question)
Clear majorities of those aged 10 to 20 and those who have the English as their first language spend less than 20 hours a week using Web 2.0 applications. All the other groups are nearly evenly divided between those who spend less than 20 hours a week and those who spend 20 or more hours a week.
Q12 The advantages of learning systems and Web 2.0 applications

For this question, respondents could select multiple responses and the percentages indicate the proportion of responses, rather than respondents. Comments are made when the proportion of responses meets or exceeds a "threshold" of 20%.

Table 4.2.3-2a Summary of Blackboard data (n=75, 9 participants did not answer the question)

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<th>Free of cost</th>
<th>Concurrency control</th>
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<td>10%</td>
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</tr>
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<tr>
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<td>9%</td>
<td>14%</td>
</tr>
</tbody>
</table>

The following responses meet or exceed the "threshold":

- "Not used" (those aged 10 to 20, engineering majors)
- "Ease of use" (all groups other than those aged 10 to 20)
- "Co-operative learning" (males, those aged 21 to 30, business and computing majors, both language groups)
- "Free of cost" (those with English as their first language: this opinion is mistaken)
- "Concurrency control" (those with English as their first language)
- "Personalized environments" (computing majors)

More females than males have used Blackboard and consider it is easy to use.
Table 4.2.3-2b Summary of Facebook data (n=75, 9 participants did not answer the question)

<table>
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<th></th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative learning</th>
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<th>Concurrency control</th>
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</tr>
</thead>
<tbody>
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<td><strong>Gender</strong></td>
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<td></td>
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</tr>
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<td>19%</td>
<td>16%</td>
<td>24%</td>
<td>3%</td>
<td>11%</td>
<td>19%</td>
</tr>
<tr>
<td>Female</td>
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<td>6%</td>
<td>18%</td>
<td>17%</td>
<td>23%</td>
<td>3%</td>
<td>11%</td>
<td>21%</td>
</tr>
<tr>
<td>31-40</td>
<td>10%</td>
<td>18%</td>
<td>18%</td>
<td>26%</td>
<td>5%</td>
<td>10%</td>
<td>13%</td>
</tr>
<tr>
<td>More than 40</td>
<td>13%</td>
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<td>19%</td>
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<tr>
<td><strong>Major studying</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>4%</td>
<td>19%</td>
<td>19%</td>
<td>25%</td>
<td>4%</td>
<td>12%</td>
<td>17%</td>
</tr>
<tr>
<td>Computing</td>
<td>7%</td>
<td>20%</td>
<td>17%</td>
<td>25%</td>
<td>4%</td>
<td>8%</td>
<td>19%</td>
</tr>
<tr>
<td>Engineering</td>
<td>5%</td>
<td>23%</td>
<td>9%</td>
<td>27%</td>
<td>0%</td>
<td>14%</td>
<td>23%</td>
</tr>
<tr>
<td><strong>English first language</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>10%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>20%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td>No</td>
<td>6%</td>
<td>19%</td>
<td>17%</td>
<td>24%</td>
<td>8%</td>
<td>11%</td>
<td>20%</td>
</tr>
</tbody>
</table>

The following responses meet or exceed the "threshold":

- "Ease of use" (those aged 10 to 20, computing and engineering majors, those with English as their first language)
- "Co-operative learning" (those with English as their first language)
- "Free of cost" (all groups)
- "Concurrency control" (those with English as their first language)
- "Personalised environments" (those aged 10 to 30, engineering majors, those with English not their first language)

More males than females have not used Facebook. This result is supported by NingShen and Khalifa (2010), who reported that more females than males use Facebook to conduct co-operative work such as obtaining information, providing information, generating ideas, learning how to do things and solving problems. The proportion of respondents who have not used Facebook increases with age. This result is supported by Joinson (2008), who pointed out that age correlated negatively with Facebook use. According to Chong and Bo (2011), Facebook is the most frequently explored social media application.
Table 4.2.3-2c Summary of Google apps data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Ease of use" (males, those aged 10 to 30, those aged more than 40, computing and engineering majors, both language groups)
- "Co-operative learning" (those with English as their first language)
- "Free of cost" (all groups except engineering majors)

Blau and Caspi (2009, p. 50) noted that all the participants in their research rated Google docs as easy or very easy to use. Although “concurrency control” editing is an excellent feature of Google applications it seems that few respondents have identified that, no matter which category they fall within. This may be because Google Docs and calendar (the applications that have the feature of “concurrency control”) are not very popular among the users. When people use Google applications, most of them use the search engine, Blog or Group (forum) features. Besides, Google docs have some weaknesses, for instance lacking academic functionalities especially for spreadsheet and not being totally compatible with MS Office (Dekeyser & Watson, 2003).
The following responses meet or exceed the "threshold":

- "Not used" (all groups except for computing majors and those with English as their first language)
- "Ease of use" (those with English as their first language)
- "Co-operative learning" (those with English as their first language)
- "Concurrency control" (those with English as their first language)

More females than males have not used Moodle. Nearly a third of respondents had no experience with Moodle. There are two main target groups in this research. One is Unitec Masters of Computing students and another is students who belong to a particular Facebook community. The Unitec group only started using Moodle last year. Most of the respondents from the Facebook community were the students of Massey University, Waikato University, AUT and Auckland University, and these universities make little, if any, use of Moodle.
Table 4.2.3-2e Summary of MSN data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (those with English as their first language)
- " Ease of use" (males, those aged 10 to 20, engineering majors, those with English not their first language)
- "Free of cost" (all groups)
- "Concurrency control" (those with English as their first language)
- "Personalized environments" (females, those aged more than 40, engineering majors, those with English as their first language)

More males than females have not used MSN.

Table 4.2.3-2f Summary of YouTube data (n=75, 9 participants did not answer the question)
The following responses meet or exceed the "threshold":

- "Not used" (business majors)
- "Ease of use" (all groups)
- "Free of cost" (all groups)

More females than males have not used YouTube (this result is supported by Molyneaux, et al, 2008). The older group of respondents (those aged more than 40) have used YouTube less than the others. This result is consistent with the research of Chong and Bo (2011), who found that “Video sharing sites are even more ubiquitous with younger age groups, with 89% of Internet users between the ages of 18-29 using video sharing sites” and of Meeyounget, Haewoon, Rodriguez, Young-Yeol and Sue (2009) who found that on YouTube, “more videos belonged to younger age groups than older ones” (p. 1364).

**Q13 The advantages of Web 2.0 technologies**

For this question, respondents could select multiple responses and the percentages indicate the proportion of responses, rather than respondents. Comments are made when the proportion of responses meets or exceeds a "threshold" of 20%.

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative</th>
<th>Free of cost</th>
<th>Concurrency</th>
<th>Virtualized</th>
<th>Personalised</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>7%</td>
<td>20%</td>
<td>18%</td>
<td>24%</td>
<td>4%</td>
<td>6%</td>
<td>20%</td>
</tr>
<tr>
<td>Female</td>
<td>6%</td>
<td>22%</td>
<td>19%</td>
<td>23%</td>
<td>5%</td>
<td>4%</td>
<td>23%</td>
</tr>
<tr>
<td><strong>Age range</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-20 year</td>
<td>12%</td>
<td>29%</td>
<td>12%</td>
<td>24%</td>
<td>6%</td>
<td>0%</td>
<td>18%</td>
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<tr>
<td>21-30</td>
<td>6%</td>
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<td>20%</td>
<td>23%</td>
<td>3%</td>
<td>6%</td>
<td>20%</td>
</tr>
<tr>
<td>31-40</td>
<td>7%</td>
<td>17%</td>
<td>17%</td>
<td>24%</td>
<td>7%</td>
<td>5%</td>
<td>24%</td>
</tr>
<tr>
<td>More than 40</td>
<td>5%</td>
<td>20%</td>
<td>15%</td>
<td>25%</td>
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<td>5%</td>
<td>25%</td>
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<td><strong>Major studying</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>4%</td>
<td>23%</td>
<td>21%</td>
<td>25%</td>
<td>4%</td>
<td>4%</td>
<td>21%</td>
</tr>
<tr>
<td>Computing</td>
<td>5%</td>
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<td>25%</td>
<td>4%</td>
<td>6%</td>
<td>21%</td>
</tr>
<tr>
<td>Engineering</td>
<td>21%</td>
<td>29%</td>
<td>14%</td>
<td>21%</td>
<td>0%</td>
<td>0%</td>
<td>14%</td>
</tr>
<tr>
<td>English first language</td>
<td>0%</td>
<td>18%</td>
<td>9%</td>
<td>27%</td>
<td>18%</td>
<td>9%</td>
<td>18%</td>
</tr>
<tr>
<td>No</td>
<td>7%</td>
<td>21%</td>
<td>19%</td>
<td>23%</td>
<td>4%</td>
<td>5%</td>
<td>22%</td>
</tr>
</tbody>
</table>

Table 4.2.3-3a Summary of Blogging data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (engineering majors)
- "Ease of use" (all groups other than those aged 31 to 40 and those with English not their first language)
● "Co-operative learning" (those aged 21 to 30, business majors)
● "Free of cost" (all groups)
● "Personalized environments" (both genders, those aged more than 20, business and computing majors, those with English not their first language)

Similar percentages of male and female respondents identified that all the features of Blogging contributed to learning. This result is supported by Pusnik, Sumak, and Hericko (2010), who found no difference between males and females in using Blogging for learning.

Table 4.2.3 -3b  Summary of Forum data (n=75, 9 participants did not answer the question)

<table>
<thead>
<tr>
<th>Gender</th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative learning</th>
<th>Free of cost</th>
<th>Concurrency control</th>
<th>Virtualized environments</th>
<th>Personalized environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>2%</td>
<td>25%</td>
<td>22%</td>
<td>27%</td>
<td>7%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Female</td>
<td>5%</td>
<td>19%</td>
<td>25%</td>
<td>19%</td>
<td>6%</td>
<td>9%</td>
<td>17%</td>
</tr>
<tr>
<td>Age range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-20 year</td>
<td>4%</td>
<td>26%</td>
<td>22%</td>
<td>22%</td>
<td>13%</td>
<td>9%</td>
<td>4%</td>
</tr>
<tr>
<td>21-30</td>
<td>2%</td>
<td>22%</td>
<td>23%</td>
<td>23%</td>
<td>5%</td>
<td>8%</td>
<td>17%</td>
</tr>
<tr>
<td>31-40</td>
<td>7%</td>
<td>17%</td>
<td>21%</td>
<td>26%</td>
<td>7%</td>
<td>10%</td>
<td>12%</td>
</tr>
<tr>
<td>More than 40</td>
<td>6%</td>
<td>25%</td>
<td>31%</td>
<td>19%</td>
<td>6%</td>
<td>6%</td>
<td>6%</td>
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<tr>
<td>Major studying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>2%</td>
<td>20%</td>
<td>22%</td>
<td>26%</td>
<td>6%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>Computing</td>
<td>3%</td>
<td>22%</td>
<td>24%</td>
<td>24%</td>
<td>5%</td>
<td>7%</td>
<td>15%</td>
</tr>
<tr>
<td>Engineering</td>
<td>5%</td>
<td>26%</td>
<td>21%</td>
<td>21%</td>
<td>5%</td>
<td>11%</td>
<td>11%</td>
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<tr>
<td>English first language</td>
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<td></td>
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<tr>
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<td>No</td>
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<td>23%</td>
<td>24%</td>
<td>6%</td>
<td>8%</td>
<td>14%</td>
</tr>
</tbody>
</table>

The following responses meet or exceed the "threshold":

● "Ease of use" (all groups other than females and those aged 31 to 40)
● "Co-operative learning" (all groups)
● "Free of cost" (all groups other than females, those aged more than 40 and those with English as their first language)

More females than males have not used Forum. More males than females identified “ease of use” as a feature of Forum. This result may relate to the research of Pedersen and Macafee (2007), who found that males were good at handling technology.
The following responses meet or exceed the "threshold":

- "Ease of use" (all groups)
- "Co-operative learning" (those aged 21 to 30, computing majors, those with English as their first language)
- "Free of cost" (all groups except for those with English as their first language)

Similar percentages of males and females considered “ease of use” and “co-operative learning” as good features of WiKi. This result is supported by Wu, Hsu, Teng and Wu (2009) who found that there was no difference between genders in the use of WiKi for co-operative working and ease of use.

Q14 The disadvantages of learning systems and Web 2.0 applications

For this question, respondents could select multiple responses and the percentages indicate the proportion of responses, rather than respondents. Comments are made when the proportion of responses meets or exceeds a "threshold" of 25% (higher than for question 12 and 13 because there are fewer options to select).
Table 4.2.3-4a Summary of Blackboard data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (males, those aged 10 to 20, business and engineering majors)
- “Difficult to control information” (those with English as their first language)
- “Lack of technical support” (those with English as their first language)
- “Not compatible with commonly used applications” (both genders, those aged 21 to 30 or more than 40, computing majors, those with English not their first language)
- “Not have enough functions for academic use” (males, those aged 21 to 40, computing and engineering majors, those with English not their first language)

More males than females have not used Blackboard.
Table 4.2.3-4b Summary of Facebook data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (those with English as their first language)
- “Difficult to control information” (males, those aged 10 to 20, those aged more than 40, business and engineering majors, both language groups)
- “Lack of technical support” (those aged more than 40, business majors, those with English as their first language)
- “Not compatible with commonly used applications” (computing majors)
- “Not have enough functions for academic use” (all groups except for those aged more than 30)

More males than females have not used Facebook. NingShen and Khalifa (2010) found that both males and females are cautious about sharing their personal information on Facebook because it is so hard to control when they post information.
Table 4.2.3-4c Summary of Google applications data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (those aged 10 to 20, engineering majors, those with English as their first language)
- “Lack of technical support” (males, those aged 10 to 30, business and computing majors, those with English as their first language)
- “Not compatible with commonly used applications” (both genders, those aged 21 to 40, business and computing majors, those with English not their first language)
- “Not have enough functions for academic use” (males, engineering majors, those with English as their first language)
Table 4.2.3-4d Summary of Moodle data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (all groups)
- “Not compatible with commonly used applications” (those aged 21 to 30, computing majors)
- “Not have enough functions for academic use” (computing majors)
The following responses meet or exceed the "threshold":

- "Not used" (those with English as their first language)
- “Difficult to control information” (those aged 10 to 20, engineering majors)
- “Lack of technical support” (females, those aged 10 to 20, business majors)
- “Not have enough functions for academic use” (all groups except for engineering majors and those with English as their first language)

More males than females have not used MSN. Liebenberg and Lotriet (2010) pointed out that the major issue with instant messaging was its synchronous nature, and noted that about 60% of their respondents, both male and female, were concerned about the issue of information control. Lu, Xiao, Sears and Jacko (2005) stated that some instant messaging services, for example MSN, do not have enough technical support for their customers.
Table 4.2.3 -4f Summary of YouTube data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (females, business majors)
- “Difficult to control information” (males, those aged 10 to 20, engineering majors, those with English as their first language)
- “Lack of technical support” (those aged 31 to 40, computing majors, those with English as their first language)
- “Not compatible with commonly used applications” (those aged 10 to 20, computing and engineering majors)
- “Not have enough functions for academic use” (business majors)

More females than males have not used YouTube.

**Q15 The disadvantages of Web 2.0 technologies**

For this question, respondents could select multiple responses and the percentages indicate the proportion of responses, rather than respondents. Comments are made when the proportion of responses meets or exceeds a "threshold" of 25%.
Table 4.2.3-5a Summary of Blogging data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (those aged 10 to 20, engineering majors)
- “Difficult to control information” (females, those aged 10 to 20, those aged more than 40, business majors, those with English as their first language)
- “Lack of technical support” (females, business majors)
- “Not compatible with commonly used applications” (those aged 10 to 20, computing majors)
- “Not have enough functions for academic use” (males, those aged 10 to 20, those aged more than 40, computing majors, those with English as their first language)

More males than females have not used Blogging.

Table 4.2.3-5b Summary of Forum data (n=75, 9 participants did not answer the question)
The following responses meet or exceed the "threshold":

- "Not used" (engineering majors)
- “Difficult to control information” (both genders, those aged 10 to 20, those aged more than 40, engineering majors, both language groups)
- “Lack of technical support” (females, those aged 10 to 20, business and engineering majors, those with English not their first language)
- “Not compatible with commonly used applications” (males)
- “Not have enough functions for academic use” (those aged more than 40, those with English as their first language)

More females than males have not used Forum

<table>
<thead>
<tr>
<th>Gender</th>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with commonly used applications such as MS Office</th>
<th>Not have enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>13%</td>
<td>25%</td>
<td>23%</td>
<td>17%</td>
<td>21%</td>
</tr>
<tr>
<td>Female</td>
<td>10%</td>
<td>24%</td>
<td>31%</td>
<td>15%</td>
<td>21%</td>
</tr>
<tr>
<td>Age Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-20 year</td>
<td>0%</td>
<td>7%</td>
<td>25%</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>21-30</td>
<td>9%</td>
<td>23%</td>
<td>29%</td>
<td>16%</td>
<td>24%</td>
</tr>
<tr>
<td>31-40</td>
<td>25%</td>
<td>18%</td>
<td>29%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>More than 40</td>
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<td>35%</td>
<td>17%</td>
<td>25%</td>
<td>25%</td>
</tr>
<tr>
<td>Major Studying</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>16%</td>
<td>19%</td>
<td>39%</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>Computing</td>
<td>7%</td>
<td>26%</td>
<td>23%</td>
<td>20%</td>
<td>24%</td>
</tr>
<tr>
<td>Engineering</td>
<td>13%</td>
<td>38%</td>
<td>25%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>English first language</td>
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<td></td>
</tr>
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<td>Yes</td>
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<td>67%</td>
<td>0%</td>
<td>0%</td>
<td>33%</td>
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<td>12%</td>
<td>23%</td>
<td>29%</td>
<td>17%</td>
<td>21%</td>
</tr>
</tbody>
</table>

Table 4.2.3-5c Summary of Wiki data (n=75, 9 participants did not answer the question)

The following responses meet or exceed the "threshold":

- "Not used" (those aged 31 to 40)
- “Difficult to control information” (males, those aged 10 to 20, those aged more than 40, computing and engineering majors, those with English as their first language)
- “Lack of technical support” (females, those aged 10 to 40, business majors, those with English not their first language)
- “Not compatible with commonly used applications” (those aged more than 40)
- “Not have enough functions for academic use” (those aged more than 40, those with English as their first language)

More males than females have not used Wiki. “Information control” is a major issue for Wiki. This result is consistent with the research of Wheeler et al. (2008), who
noted that the information can be prone to vandalism because anybody is able to post anything without permission.

More females than males did not like “Lack of technical support” for Blogging, Forum and Wiki. This result relates to previous research conducted by Pedersen and Macafee (2007) who found that males were good at handling IT technology.

**Q16 – Q21 Functions requirement analysis**

<table>
<thead>
<tr>
<th>Gender</th>
<th>Assignment &amp; Assessment submission</th>
<th>Grade book</th>
<th>Online testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>4.22</td>
<td>3.68</td>
<td>3.75</td>
</tr>
<tr>
<td>Female</td>
<td>4.3</td>
<td>3.84</td>
<td>4.03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Studying</th>
<th>Assignment &amp; Assessment submission</th>
<th>Grade book</th>
<th>Online testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>4.33</td>
<td>3.67</td>
<td>4</td>
</tr>
<tr>
<td>Computing</td>
<td>4.31</td>
<td>4.05</td>
<td>3.97</td>
</tr>
<tr>
<td>Engineering</td>
<td>4.14</td>
<td>3.14</td>
<td>3.71</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Assignment &amp; Assessment submission</th>
<th>Grade book</th>
<th>Online testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – 20</td>
<td>4.43</td>
<td>3.29</td>
<td>3.86</td>
</tr>
<tr>
<td>21 – 30</td>
<td>4.25</td>
<td>3.8</td>
<td>3.98</td>
</tr>
<tr>
<td>31 – 40</td>
<td>4.25</td>
<td>3.94</td>
<td>4</td>
</tr>
<tr>
<td>More than 40</td>
<td>4.14</td>
<td>3.57</td>
<td>3.34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>English First language</th>
<th>Assignment &amp; Assessment submission</th>
<th>Grade book</th>
<th>Online testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4.33</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>No</td>
<td>4.25</td>
<td>3.75</td>
<td>3.93</td>
</tr>
</tbody>
</table>

Table 4.2.3-6a Summary of assessment data (n=74, 10 respondents did not answer the question)

Engineering majors and those aged 10 to 20 rated Grade book as less useful than other groups did. Those aged more than 40 and those with English as their first language rated online testing as less useful that other groups did.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Course material mgr</th>
<th>Course Information searching</th>
<th>Course classification</th>
<th>Course deletion</th>
<th>Course evaluation and development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>4.19</td>
<td>4.06</td>
<td>3.97</td>
<td>3.32</td>
<td>3.89</td>
</tr>
<tr>
<td>Female</td>
<td>4.27</td>
<td>4.27</td>
<td>4</td>
<td>3.24</td>
<td>3.89</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Studying</th>
<th>Course material mgr</th>
<th>Course Information searching</th>
<th>Course classification</th>
<th>Course deletion</th>
<th>Course evaluation and development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>4.28</td>
<td>4.11</td>
<td>4.05</td>
<td>3.39</td>
<td>3.72</td>
</tr>
<tr>
<td>Computing</td>
<td>4.33</td>
<td>4.28</td>
<td>4</td>
<td>3.34</td>
<td>4</td>
</tr>
<tr>
<td>Engineering</td>
<td>4</td>
<td>4.74</td>
<td>4</td>
<td>3.29</td>
<td>4.14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Course material mgr</th>
<th>Course Information searching</th>
<th>Course classification</th>
<th>Course deletion</th>
<th>Course evaluation and development</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – 20</td>
<td>4.43</td>
<td>4.43</td>
<td>4.43</td>
<td>3.14</td>
<td>4</td>
</tr>
<tr>
<td>21 – 30</td>
<td>4.3</td>
<td>4.18</td>
<td>3.95</td>
<td>3.39</td>
<td>3.98</td>
</tr>
<tr>
<td>31 – 40</td>
<td>3.88</td>
<td>3.94</td>
<td>4</td>
<td>3.31</td>
<td>3.88</td>
</tr>
<tr>
<td>More than 40</td>
<td>4.43</td>
<td>3.29</td>
<td>3.71</td>
<td>2.71</td>
<td>3.29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>English First Language</th>
<th>Course material mgr</th>
<th>Course Information searching</th>
<th>Course classification</th>
<th>Course deletion</th>
<th>Course evaluation and development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4.33</td>
<td>4.33</td>
<td>3.57</td>
<td>2.33</td>
<td>4</td>
</tr>
<tr>
<td>No</td>
<td>4.23</td>
<td>4.15</td>
<td>3.99</td>
<td>3.52</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Table 4.2.3-6b Summary of course management data (n=74, 10 respondents did not answer the question)
Those aged more than 40 rated course information searching and course evaluation and development as less useful than other groups did. Those aged more than 40 and those with English as their first language rated course deletion as less useful that other groups did.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Address book</th>
<th>Email</th>
<th>Mobility</th>
<th>Online chat room</th>
<th>Online message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>3.5</td>
<td>4.27</td>
<td>3.58</td>
<td>3.32</td>
<td>3.67</td>
</tr>
<tr>
<td>Female</td>
<td>3.61</td>
<td>4.48</td>
<td>3.94</td>
<td>3.75</td>
<td>3.94</td>
</tr>
<tr>
<td>Major studying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>3.61</td>
<td>4.44</td>
<td>3.56</td>
<td>3.44</td>
<td>3.67</td>
</tr>
<tr>
<td>Computing</td>
<td>3.87</td>
<td>4.41</td>
<td>3.84</td>
<td>3.77</td>
<td>3.71</td>
</tr>
<tr>
<td>Engineering</td>
<td>2.85</td>
<td>4.14</td>
<td>3.71</td>
<td>2.43</td>
<td>3.75</td>
</tr>
<tr>
<td>Age Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 – 20</td>
<td>2.14</td>
<td>4</td>
<td>3.43</td>
<td>2.14</td>
<td>3.57</td>
</tr>
<tr>
<td>21 – 30</td>
<td>3.67</td>
<td>4.48</td>
<td>3.77</td>
<td>3.75</td>
<td>4.02</td>
</tr>
<tr>
<td>31 – 40</td>
<td>3.56</td>
<td>4.13</td>
<td>3.94</td>
<td>3.63</td>
<td>3.53</td>
</tr>
<tr>
<td>More than 40</td>
<td>4.17</td>
<td>4.96</td>
<td>3.67</td>
<td>3.33</td>
<td>3.17</td>
</tr>
<tr>
<td>English First Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4.33</td>
<td>4.33</td>
<td>3</td>
<td>3</td>
<td>2.67</td>
</tr>
<tr>
<td>No</td>
<td>3.52</td>
<td>4.37</td>
<td>3.8</td>
<td>3.56</td>
<td>3.85</td>
</tr>
</tbody>
</table>

Table 4.2.3-6c Summary of communication management data (n=74, 10 respondents did not answer the question)

Those aged 10 to 20 and engineering majors rated address book and online chat room as less useful than other groups did. Those with English as their first language rated mobility and online message as less useful that other groups did.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Concurrency control</th>
<th>Group page &amp; community</th>
<th>Mobility</th>
<th>Online chat room</th>
<th>Online message</th>
<th>Resource distribution &amp; Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>3.69</td>
<td>3.86</td>
<td>3.62</td>
<td>3.44</td>
<td>3.73</td>
<td>4.4</td>
</tr>
<tr>
<td>Female</td>
<td>3.97</td>
<td>4.08</td>
<td>4</td>
<td>3.72</td>
<td>3.86</td>
<td>4.26</td>
</tr>
<tr>
<td>Major studying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>3.72</td>
<td>4</td>
<td>3.83</td>
<td>3.72</td>
<td>3.67</td>
<td>4.06</td>
</tr>
<tr>
<td>Computing</td>
<td>5.92</td>
<td>4</td>
<td>3.8</td>
<td>3.58</td>
<td>3.71</td>
<td>4.41</td>
</tr>
<tr>
<td>Engineering</td>
<td>3.8</td>
<td>3.86</td>
<td>3.29</td>
<td>3.86</td>
<td>3.75</td>
<td>4.27</td>
</tr>
<tr>
<td>Age Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 – 20</td>
<td>3.7</td>
<td>5.57</td>
<td>3.43</td>
<td>2.86</td>
<td>4.43</td>
<td>4.5</td>
</tr>
<tr>
<td>21 – 30</td>
<td>3.95</td>
<td>3.97</td>
<td>3.77</td>
<td>3.86</td>
<td>4.07</td>
<td>4.32</td>
</tr>
<tr>
<td>31 – 40</td>
<td>3.69</td>
<td>3.69</td>
<td>3.94</td>
<td>3.25</td>
<td>3.38</td>
<td>4.06</td>
</tr>
<tr>
<td>More than 40</td>
<td>3.83</td>
<td>4.14</td>
<td>3.67</td>
<td>3.33</td>
<td>3.33</td>
<td>4.14</td>
</tr>
<tr>
<td>English First Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3.67</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>2.67</td>
<td>4.33</td>
</tr>
<tr>
<td>No</td>
<td>3.84</td>
<td>3.97</td>
<td>3.84</td>
<td>3.61</td>
<td>3.84</td>
<td>4.33</td>
</tr>
</tbody>
</table>

Table 4.2.3-6d Summary of co-operation management data (n=74, 10 respondents did not answer the question) chat room

Those aged 10 to 20 rated concurrency control as less useful than other groups did. Those aged 10 to 20, those with English as their first language and engineering majors rated online chat room as less useful than other groups did. Those with English as their first language rated online message as less useful than other groups did.
Table 4.2.3-6e Summary of file management data (n=74, 10 respondents did not answer the question)

Those with English as their first language rated file classification as less useful than other groups did.

Table 4.2.3-6f Summary of learning management data (n=74, 10 respondents did not answer the question)

Those aged 31 to 40 and those with English as their first language rated learning resource manager as less useful than other groups did. Those aged 10 to 20 and engineering majors rated online chat room as less useful than other groups did. Those aged 10 to 20 and those with English as their first language rated personal learning environment as less useful than other groups did. Engineering majors, those aged more than 40 and those with English as their first language rated online message as less useful than other groups did.
### 4.3 Summary of Main User Requirements

Based on the data analysis above, the user requirements can be summarized as follows:

<table>
<thead>
<tr>
<th>User requirements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ease of use</td>
<td>Based on the feedback from online questions 6,12,13,14, 15 and interview questions 5, 6, most respondents put this feature on the first place.</td>
</tr>
<tr>
<td>To offer user friendly interface</td>
<td>Based on the feedback of interview questions 7, 8, the interviewees states the opinions. One of the interviewees mentions the each function module must be at the hand, easy to switch.</td>
</tr>
<tr>
<td>To easily integrate existing digital materials (such as MS Office)</td>
<td>Based on the feedback of online questions 12,13,14,15</td>
</tr>
<tr>
<td>To offer an interactive and shared learning environment.</td>
<td>Based on the feedback of interview questions 12,13 and online questions 18,21</td>
</tr>
<tr>
<td>To leave certain degrees of freedom for the learners and then to give them the option of self control in order to enable them to teaching (learning) autonomously</td>
<td>Based on the feedback of online questions 8,12,13,21 and interview question 11</td>
</tr>
<tr>
<td>To offer online testing and assessment environment (personal and public)</td>
<td>Based on the feedback of online questions 2, 3 and interview question 16</td>
</tr>
<tr>
<td>To offer the personal learning environment to each learner</td>
<td>Based on the feedback of online questions 12, 13, 21 and interview question 8. Most respondents consider this feature as a priority.</td>
</tr>
<tr>
<td>To offer Question &amp; Answer function</td>
<td>Based on the feedback of online questions 12, 15, 16 and interview question 8. Most respondents consider this feature as a priority.</td>
</tr>
<tr>
<td>To offer both synchronous and Asynchronous communication methods.</td>
<td>Based on the feedback of online questions 12, 19,21</td>
</tr>
<tr>
<td>To offer tools for recording the communication in learning sessions as well as whole learning sessions</td>
<td>Based on the feedback of interview question 8. Respondents like to add this feature into learning system</td>
</tr>
<tr>
<td>To support audio and text translation into other languages</td>
<td>Based on the feedback of interview question 8. Respondents like to add this feature into learning system</td>
</tr>
<tr>
<td>8 sub functionality modules (see figure 2.5.4 a) of learning system</td>
<td>Based on the summary of online questions 16 to 21 and interview questions 1 to 8. A majority of respondents consider these modules are very important</td>
</tr>
</tbody>
</table>

Table 4.3 User requirement summary and reasons
Chapter V Requirement analysis

5.1 User requirements

After the completion of the online survey and interviews, the user requirements have been summarized and displayed below:

- To be easy to use (easy to switch each function module)
- To offer a user-friendly interface (GUI)
- To easily integrate existing digital materials (such as MS Office)
- To offer tools for recording the communication in learning sessions as well as whole learning sessions
- To offer an interactive and shared learning environment
- To support audio and text translation into other languages
- To leave certain degrees of freedom for the learners and then to give them the option of self control in order to enable them to teach/learn autonomously
- To offer online testing and assessment environment (personal and public)
- To offer the personal learning environment to each learner
- To offer Question & Answer function
- To offer both synchronous and asynchronous communication methods.
- To offer eight sub function systems.

5.2 Objectives and main user interface

The objective of this section is to propose and design a suitable architecture for an e-learning 2.0 system, model the whole system by using UML and construct the document that captures the user requirements and use cases.

This document will help the developer understand user requirements, how the system works and related operations. It is expected that the developer will have enough information for further development for the project (for instance, development and implementation).

The basic architecture of system is presented below.
The advantages of this architecture are that it provides various functions based on Web 2.0 technologies for instance, the function like MSN that will be used to conduct real time communication with students and the function like Blog that will be used to conduct discussions among students. Consequently, it is designed not only to optimize the learning process but also to largely improve the efficiency of learning.
5.3 System scope

The system provides several function modules for learners. The function modules assist the learner and the lecturer to conduct online learning. After completion of registration for the learning programme or courses, the learner is able to access the entire system. Also, the system will assign privileges for accessing the system to users based on their identity. Any person who has been successfully registered will then become a direct user of this system. However, based on the predetermined requirement of the project, this system only involves the online learning part, as a result, there are only two users in this system, learner and lecturer.

The system also contains both manual and automated processes. However, this system will focusing on the online learning processes especially for the processes adoption of Web 2.0 techniques. Therefore, all the activities like course and student enrollment, school administration processes and system administration maintenance are not included in the system.

Although only two users are included in the system, because of using web 2.0 techniques, those two users may play other roles according to different circumstances, for instance a learner will be an information seeker, examinee, or student. A lecturer will be able to play evaluator, system administration or tutor roles.

5.4 Process of E-learning 2.0 System narratives

This section describes the general process for each function module. The basic process of the system consisted of three main sub systems, which are register and enrollment, online learning and teaching, and maintenance. The diagram is presented below:

![Figure 5.4 E-learning 2.0 processes](image)

However, based on the system scope, this system only focuses on the processes that are involved in the online learning and teaching.
5.4.1 Registration and Enrollment system

Users must register prior to accessing the system. After the users have registered successfully, their information will be stored in the system database automatically. Then, if the users access the system, they will use their own user names and passwords that were created on registration. Then, the system will authenticate the users. After successfully accessing the system, users can access the online learning and teaching and the maintenance phase, and then choose any functions model according to their requirements.

5.4.2 Online learning and teaching and maintenance System

5.4.2.1 Process of Course management

Based on the results of the online survey and the interviews, five main processes are involved in course management, which are course material management, course information searching, course classification, course evaluation and development and course selection. When the learners log into the system and access this specific module successfully, they are able to select any sub section according to their needs.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course material management</td>
<td>Provides the basic functions to manage the course such as upload, download, category and remove</td>
</tr>
<tr>
<td>Course information searching</td>
<td>Helps learners to search any information that is related to the specific course</td>
</tr>
<tr>
<td>Course classification</td>
<td>Allows learners to categorize their courses based on their requirements.</td>
</tr>
<tr>
<td>Course evaluation and development</td>
<td>Offers a tool to evaluate and develop courses</td>
</tr>
<tr>
<td>Course selection</td>
<td>Allows learners to select from the available courses</td>
</tr>
</tbody>
</table>

Table 5.4.2.1 Course management

5.4.2.2 Process of File management

File management consists of nine main processes, which are file upload, file download, file type transfer, file classification, file share, file search, file remove, file move and folder creation.
### 5.4.2.2 File management

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>File upload</td>
<td>User selects an external file and then uploads it to the learning space</td>
</tr>
<tr>
<td>File download</td>
<td>User selects an internal file and then downloads it from the learning space</td>
</tr>
<tr>
<td>File type transfer</td>
<td>User selects a file and then transfers it into another type</td>
</tr>
<tr>
<td>File classification</td>
<td>User selects an internal file and assigns it a category based on system settings</td>
</tr>
<tr>
<td>File share</td>
<td>User selects a file and then shares it with another user</td>
</tr>
<tr>
<td>File search</td>
<td>User searches a file based on the system settings</td>
</tr>
<tr>
<td>File remove</td>
<td>User selects an internal file and then removes it from the system</td>
</tr>
<tr>
<td>File move</td>
<td>User selects an internal file and moves it into another location</td>
</tr>
<tr>
<td>Folder creation</td>
<td>User creates a folder for storing files</td>
</tr>
</tbody>
</table>

Table 5.4.2.2 File management

### 5.4.2.3 Process of communication management

Communication management consists of three main sub processes, which are online chat room, instant message and email.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online chat room</td>
<td>User selects this function and then chats with another user</td>
</tr>
<tr>
<td>Instant message</td>
<td>User selects this function and then sends an message to another user</td>
</tr>
<tr>
<td>Email</td>
<td>User selects this function and then sends an email to another user</td>
</tr>
</tbody>
</table>

Table 5.4.2.3 Communication management

### 5.4.2.4 Process of testing management

Testing management consists of six main sub processes, which are test participation, delay and cancel a test, take a test, submit and view a result.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test participation</td>
<td>User selects a test, and then books it.</td>
</tr>
<tr>
<td>Delay &amp; cancel a test</td>
<td>User delays or cancels the test</td>
</tr>
<tr>
<td>Take a test</td>
<td>User selects a test and then participates in the test (User also can pause the test during the progress)</td>
</tr>
<tr>
<td>Submit a result</td>
<td>User submits the test result</td>
</tr>
<tr>
<td>View a result</td>
<td>Use views the test result or prints the test report</td>
</tr>
</tbody>
</table>

Table 5.4.2.4 Testing management
5.4.2.5 Process of co-operation management

Co-operation management consists of three main sub processes, which are online chat room, online instant message, and personal learning space.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online chat room</td>
<td>User chats with other users (same as communication management)</td>
</tr>
<tr>
<td>Online instant message</td>
<td>User sends a message to other users (same as communication management)</td>
</tr>
<tr>
<td>Personal learning space</td>
<td>User creates own personal learning space. Options include changing font, colour and layout of screen.</td>
</tr>
</tbody>
</table>

Table 5.4.2.5 Co-operation management

5.4.2.6 Process of Question and Answer management

Question and Answer management consists of two main sub processes, which are online chat room and online instant message.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online chat room</td>
<td>User chats with other users</td>
</tr>
<tr>
<td>Online instant message</td>
<td>User sends a message to other users</td>
</tr>
</tbody>
</table>

Table 5.4.2.6 Question and answer management

5.4.2.7 Process of learning control management

Learning process management is an important section of the system that consists of four sub processes: personal learning space, virtual classroom, collaborative platform and learning kit.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage personal learning space (PLE)</td>
<td>User manages own personal learning environment. Options include changing font, colour and layout of screen.</td>
</tr>
<tr>
<td>Virtual classroom</td>
<td>User participates in an online real-time class</td>
</tr>
<tr>
<td>Collaborative platform</td>
<td>User conducts collaborative work</td>
</tr>
<tr>
<td>Learning kit</td>
<td>Offers the tools to help the user to conduct the learning process</td>
</tr>
</tbody>
</table>

Table 5.4.2.7 Learning control management
5.4.2.8 Process of teaching control management

Learning process management is an important section of the system that consists of three sub processes: personal teaching space, virtual classroom, and teaching kit.

<table>
<thead>
<tr>
<th>Process name</th>
<th>Process description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage Personal teaching space</td>
<td>User sets or resets the teaching space. Options include changing font, colour and layout of screen.</td>
</tr>
<tr>
<td>Virtual classroom</td>
<td>User conducts online real-time teaching</td>
</tr>
<tr>
<td>Teaching kit</td>
<td>Offers tools to help the user to conduct the teaching process</td>
</tr>
</tbody>
</table>

Table 5.4.2.8 Teaching control management

5.5 Basic function modules of E-learning 2.0 system

The basic function modules of E-Learning 2.0 are shown in the following table.

<table>
<thead>
<tr>
<th>Module name</th>
<th>Sub modules</th>
<th>Main Functions description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course management</td>
<td>- course material management&lt;br&gt;- course information searching&lt;br&gt;- course classification&lt;br&gt;- course evaluation &amp; development&lt;br&gt;- course selection</td>
<td>- Management tools includes add, remove, view&lt;br&gt;- Search course information&lt;br&gt;- Categorize a course&lt;br&gt;- Evaluate a course&lt;br&gt;- View the result&lt;br&gt;- Select a course</td>
</tr>
<tr>
<td>File management</td>
<td>- File download&lt;br&gt;- File upload&lt;br&gt;- File type transfer&lt;br&gt;- File share&lt;br&gt;- File classification&lt;br&gt;- File search&lt;br&gt;- File remove&lt;br&gt;- File move&lt;br&gt;- Folder creation</td>
<td>- Download a file&lt;br&gt;- Upload a file&lt;br&gt;- Transfer file types&lt;br&gt;- Share the file with other users&lt;br&gt;- Search a file&lt;br&gt;- Categorize a file&lt;br&gt;- Moves a file into another location&lt;br&gt;- Create a folder</td>
</tr>
<tr>
<td>Communication management</td>
<td>- Synchronized types&lt;br&gt;- Asynchronous types</td>
<td>- Conduct the online communication both synchronized and asynchronous&lt;br&gt;- Store the user contact information</td>
</tr>
<tr>
<td>Co-operation management</td>
<td>- Co-user account management&lt;br&gt;- Co-PLE management&lt;br&gt;- Co-learning material management</td>
<td>- Conduct the operations of co-account management such as add, remove and block&lt;br&gt;- Conduct the operations of co-PLE management such as add, remove&lt;br&gt;- Conduct the operations of co-learning material management such as add, remove, download, share, search, category</td>
</tr>
<tr>
<td>Teaching control process</td>
<td>- Teaching environment&lt;br&gt;- Virtual classroom&lt;br&gt;- Teaching Kit</td>
<td>- Manage user account&lt;br&gt;- Set reset the personal teaching space&lt;br&gt;- Conduct online real-time teaching including online exercise, assessment, question &amp; answer and test, learning material management, class discussion</td>
</tr>
<tr>
<td>Learning control process</td>
<td>- Personal learning space (PLE)&lt;br&gt;- Virtual classroom&lt;br&gt;- Collaborative platform&lt;br&gt;- Learning kit</td>
<td>- Create and manage the personal learning environment&lt;br&gt;- Take the real-time online learning&lt;br&gt;- Manage the learning materials&lt;br&gt;- Conduct collaborative working</td>
</tr>
<tr>
<td>Testing management</td>
<td>- Online testing</td>
<td>- Conduct online test&lt;br&gt;- View exam and assessment result</td>
</tr>
<tr>
<td>Question and Answer</td>
<td>- Online question&lt;br&gt;- Online answer</td>
<td>- Ask questions&lt;br&gt;- Offer answers</td>
</tr>
</tbody>
</table>

Table 5.5 Basic functions of E-Learning 2.0
5.6 Business role

- All users must register and select a course prior to using the system
- Learner and lecturer are the only two users to access the system. Also, users only have a single login, which will have a password and user name for the protection of information
- The user is capable of being tracked by using this system
- Any new input of information should undergo some form of verification
- Users must have full privileges to manage their own PLEs (Personal Learning Environments)
- Different users have different privileges to access the system
- Only the lecturer has the privilege to create tests.

5.7 Stakeholders

The stakeholders of E-Learning 2.0 are shown in the following table.

<table>
<thead>
<tr>
<th>Role</th>
<th>Description</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner</td>
<td>In this system, learners are treated as students, in general. When information seekers register in the E-Learning system, they become learners and when learners participate in tests, they become examinees.</td>
<td>• Participate in the real-time online course (video) and the online testing • Participate in online discussion (audio, video or text), currency control editing • Send Emails • Send feedback and comments to other users • Ask and answer online questions • Upload, share and manage their own files • Create and manage own files, assignments, tests • Search and share learning materials • Submit course assignments</td>
</tr>
<tr>
<td>Lecturer</td>
<td>In this system, lecturers are treated as tutors, in general. They are the people who provide information or course material to information seekers. At this time, lecturers act as academic experts. During teaching sessions, lecturers act as teachers. During the evaluation of students’ answer scripts, lecturers act as evaluators.</td>
<td>• Participate in and manage the real-time online course (video) • Manage and marking online testing • Participate in online co-operative working including online discussion (audio, video or text), currency control editing • Send Email • Provide course guideline and framework • Ask and answer the online questions • Send comment and feedback to other users • Upload, share and manage their own files • Create and manage own personal learning space • Search and share learning materials • Mark course assignments and online tests • Manage the students account</td>
</tr>
<tr>
<td>System administrator</td>
<td>System administrators manage the user accounts and maintain the databases.</td>
<td>• Manage user accounts • Setup the properties of personal learning space • Manage all the databases</td>
</tr>
</tbody>
</table>

Table 5.7 Stakeholder description
Chapter VI  UML Design

In order to design an E-learning 2.0 system, the first step is the domain description by using the domain model. Then, the use case diagram that will be used to illustrate the approval process and classification process of system is depicted. The main functions of the system that can be conducted by the related users are also presented. This function is associated with a use case, which can interact between the user or object and the system. Use case diagrams display the use cases and the related users or objectives. However, UML is not capable of capturing users’ abstract requirements or objects in some specific circumstance. For example, it is highly unlikely to use UML to represent the users’ expectation about system security, stability, availability and flexibility, because UML is the tool that links or connects the requirements with the actual operations or actions that occur in the real system (Maciaszek, 2005).

6.1 Actors

Because this system concentrates on the learning and studying process, only the people who are involved in learning and studying can be considered.

<table>
<thead>
<tr>
<th>Name of actors</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner</td>
<td>One of the main inside users of the system: when information seekers or students or examinees register, they become learners.</td>
</tr>
<tr>
<td>Information seeker</td>
<td>A person who tries to seek information or materials inside or outside the system</td>
</tr>
<tr>
<td>Student</td>
<td>A person who intends to study a particular program</td>
</tr>
<tr>
<td>Examinee</td>
<td>A person who participates in a test in this system</td>
</tr>
<tr>
<td>Lecturer</td>
<td>A person who takes a teaching role in the school. A lecturer may take three other roles, which are academic expert, evaluator and tutor</td>
</tr>
<tr>
<td>Academic expert</td>
<td>A person who is an expert in one or more academic areas, and is able to answer questions on his or her specific area(s).</td>
</tr>
<tr>
<td>Evaluator</td>
<td>A person who evaluates the answers of students</td>
</tr>
<tr>
<td>Tutor</td>
<td>A person who is able to conduct the teaching process in the system</td>
</tr>
</tbody>
</table>

Table 6.1 Description of actors
6.2 Domain model

Figure 6.2 E-learning 2.0 system domain model
6.3 Use case diagram

6.3.1 Top level (origination process)

6.3.2 Second level (system process)

This system is focused on the studying phase. In order to clearly describe the system process, this section separates the whole system and introduces each of sub modules.
6.3.2.1 Use case of Communication management

This use case is based on the requirement “To offer both synchronous and asynchronous communication methods” and the results of the online survey (Table 4.1.1-10).
6.3.2.2 Use case of Co-operation management

This use case is based on the requirements “To offer an interactive and shared learning environment” “To offer the personal learning environment to each learner” and “To easily integrate existing digital materials (such as MS Office)” and the results of the online survey (Figure 4.1.1 d and Table 4.1.1-11).

Figure 6.3.2.2  Co-operation management use case diagram
6.3.2.3 Use case of File management

This use case is based on the requirement of “To leave certain degrees of freedom for the learners and then to give them the option of self control in order to enable them to teaching (learning) autonomously” and the results of the online survey (see Table 4.1.1-12).

6.3.2.4 Use case of course management

This use case is based on the requirements “To leave certain degrees of freedom for the learners and
then to give them the option of self control in order to enable them to teach/learn autonomously” and “To offer tools for recording the communication in learning sessions as well as whole learning sessions” and the results of the online survey (Table 4.1.1-9).

6.3.2.5 Use case of learning process control management

![Learning process control management use case diagram]

This use case is based on all the requirements (except the item of “friendly user interface”) and the results of the online survey (Table 4.1.1-13).
6.3.2.6 Use case of teaching process control management

This use case is based on all the requirements (except the item of “friendly user interface”) and the results of the online survey (Table 4.1.1-13).

6.3.2.7 Use case of Question & Answer management

This use case is based on all the requirements (except the item of “friendly user interface”) and the results of the online survey (Table 4.1.1-13).
This use case is based on the requirement “To offer Question & Answer function”

### 6.3.2.8 Use case of test management

![Test management use case diagram](image)

This use case is based on the requirement “To offer online testing and assessment environment (personal and public)” and the results of the online survey (Table 4.1.1-8).

### 6.4 Use case details description

The purpose of this section is to describe details of the main use cases in the system. However, this section only describes two use cases, which are, user registration and system authentication. The other use cases are described in appendix 1.

#### 6.4.1 User registration

**INTENT:**
In order to use the system, users must conduct the registration first then start to use the system.

**OVERVIEW:**
When users intend to participate in the school program, they need to register on the system, after successful registration, personal details that include user name and password must be recorded in the system.

**PRE-CONDITIONS**
The registration window is displayed to the user successfully
The user is able to fill in the correct information based on the system required.

**POST-CONDITIONS**
1. User access to computer has been authenticated
2. After completion of a successful registration, the user’s information for system is stored
3. The system alters the user login personal information

**MAIN FLOWS**
1. The user goes to the system main interface
2. The user selects the “registration” option
3. The user fills the online application based on the system requirements
4. The user submits the online application
5. The system accepts the application, conducts the validation check, and stores the application

**ALTERNATIVE FLOWS**
5
a. If the information is not correct, go back to step 3 and give the user reminder information
b. If the information is filled in correctly, the system will display a message to the user.

**EXCEPTION FLOWS**
2
The system fails to load the “registration” module
3
The system fails to store the user’s information because formatting needs attention
   a. Display problems
   b. Undo the data transaction
   c. Return to 1

### 6.4.2Authentication

**INTENT:**
In order to ensure the security, the user must be authenticated by the system.

**OVERVIEW:**
When users access the system, they need to be authenticated, after successful authentication all function modules must be available for the user.

**PRE-CONDITIONS**
The windows for authentication are displayed to the user successfully
The user is able to enter the user name and password based on the system required.

**POST-CONDITIONS**
1. User access to the e-learning system
2. After completion of the authentication process, the function modules must appear in the system

**MAIN FLOWS**
1. User goes to the system
2. The system displays authentication window
3. User enters the user name and password
4. The system checks the information
5. The system displays all the functions modules and a message about valid information

**ALTERNATIVE FLOWS**
3
   a. if the user enter the wrong user name or password, the system reports the problem
   b. if the user has too many failures, the system will exit automatically

**EXCEPTION FLOWS**
5
   The system fails to load the all function modules

### 6.4.3 Course selection

**INTENT:**
In order to participate in the online course, the user is able to select the available course in the system.

**OVERVIEW:**
The user is able to select the available course

**PRE-CONDITIONS**
The window of course selection is displayed to the user successfully
The user is able to select the course based on the his /her requirements

**POST-CONDITIONS**
User access to course management module and all course names must appear
MAIN FLOWS
1. The user goes to course manager
2. The system displays all available courses
3. The user makes the selection
4. The user submits the requirements
5. The system conducts the validation check and then does the related operations

ALTERNATIVE FLOWS
3
The user is able to make more selections

5
a. If the user does not select any courses, the system inform the user
b. If the user does select the course, the system follows this operation to make the selection

EXCEPTION FLOWS
1
The System fails to load “course manager” window

5. The System fails to make the selection
a. Display problems
b. Undo the data transaction
c. Return to 3
6.5 Activity diagram

The purpose of this section is to use activity diagrams to describe the main use cases inside the system. However, this section only describes two use cases, which are, user registration and system authentication. The other use cases are described in appendix 2.
6.5.1 Registration

Figure 6.5.1 Registration activity diagrams
6.5.2 Authentication

<table>
<thead>
<tr>
<th>User</th>
<th>E-learning System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter Login ID and PW</td>
<td>Display login screen</td>
</tr>
<tr>
<td>No</td>
<td>Validate</td>
</tr>
<tr>
<td>Too many failures</td>
<td>Goto main page</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6.5.2 Authentication activity diagrams
6.5.3 Course selection

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the course manager</td>
<td>Display course manager window</td>
</tr>
<tr>
<td>View the available courses</td>
<td></td>
</tr>
<tr>
<td>Select a course</td>
<td>Validation check</td>
</tr>
<tr>
<td>Yes</td>
<td>Valid</td>
</tr>
<tr>
<td>Any more?</td>
<td>Inform the user</td>
</tr>
<tr>
<td>No</td>
<td>Invalid</td>
</tr>
<tr>
<td>Submit the request</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6.5.3 course selection
## 6.6 CRC Cards

The following tables show the responsibilities of each main class.

### Lecturer

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store information of lecturer such as Lecturer ID,</td>
<td></td>
</tr>
<tr>
<td>username, password</td>
<td></td>
</tr>
</tbody>
</table>

### Learner

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store information of learner such as username,</td>
<td></td>
</tr>
<tr>
<td>password</td>
<td></td>
</tr>
</tbody>
</table>

### AccessSystem

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allow the user to access the system through</td>
<td></td>
</tr>
<tr>
<td>authentication</td>
<td></td>
</tr>
<tr>
<td>Grant different privileges to different users</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• MainForm</td>
</tr>
<tr>
<td></td>
<td>• Lecturer</td>
</tr>
<tr>
<td></td>
<td>• Learner</td>
</tr>
</tbody>
</table>

### MainForm

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer the interface for the user to interact with</td>
<td></td>
</tr>
<tr>
<td>the system</td>
<td></td>
</tr>
<tr>
<td>Quit this system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CourseMgr</td>
</tr>
<tr>
<td></td>
<td>• CommunicationMgr</td>
</tr>
<tr>
<td></td>
<td>• Co-operation Mgr</td>
</tr>
<tr>
<td></td>
<td>• FileMgr</td>
</tr>
<tr>
<td></td>
<td>• ExamMgr</td>
</tr>
<tr>
<td></td>
<td>• LearningMgr</td>
</tr>
<tr>
<td></td>
<td>• TeachingMgr</td>
</tr>
<tr>
<td></td>
<td>• Question</td>
</tr>
<tr>
<td></td>
<td>&amp;AnswerMgr</td>
</tr>
</tbody>
</table>

### CourseMgr

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer the function module for the user to manage the</td>
<td></td>
</tr>
<tr>
<td>course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>•</td>
</tr>
</tbody>
</table>

### CommunicationMgr

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer the function module for the user to conduct</td>
<td>CommunicationTypeSele</td>
</tr>
<tr>
<td>Communication Type Selection</td>
<td>CommunicationMgr</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to select communication types</td>
<td>CommunicationMgr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Co-operation Mgr</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to conduct the co-operative process with other users</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>File Mgr</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to manage files</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Mgr</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to participate in an online test</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Learning Mgr</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to conduct the online learning process</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Mgr</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to conduct the online teaching process</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question &amp; Answer Mgr</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Responsibilities</td>
<td>Collaboration</td>
</tr>
<tr>
<td>Offer the function module for the user to conduct the online question and answer process</td>
<td></td>
</tr>
</tbody>
</table>
Chapter VII Conclusion

Integration of web 2.0 technologies or applications into E-learning systems is a strong trend of future learning. With the wider usage of web 2.0, E-Learning 1.0 develops into E-Learning 2.0 with some new features, like interaction (Blog, Forum), collaboration (Wiki, Google docs), sociality (Facebook, Youtube) and 3D virtual learning space (Second Life). These web 2.0 technologies and applications can enhance the accessibility of learning, teaching and training and present a new chapter for the E-learning.

This study focuses on addressing and determining the requirements of an E-learning 2.0 system. The primary questions of the study are: what are the user requirements of E-learning 2.0, and how can an E-learning 2.0 system be modeled using UML in line with these requirements? To answer these questions clearly, four secondary questions were posed:

- What are the user experiences of Blackboard and Moodle?
  This question has been answered by questions 9, 12 and 14 of the online survey and questions 2, 3, 5 and 6 of the interview.

- How is Web 2.0 used in learning?
  This question has been answered by questions 7 and 8 of the interview

- What are the advantages of Web 2.0?
  This question has been answered by question 12 of the online survey and question 4 of the interview

- What are the disadvantages of Web 2.0?
  This question has been answered by question 14 of the online survey and question 6 of the interview

The data for those questions can be found in section 4.1.1(online survey) and section 4.1.2 (interview), and the related discussion can be found in section 4.2.1 (online survey) and section 4.2.2 (interview).

To deal with the primary questions, a three-tier E-Learning Model (section 2.5.4) was created based on the literature review, and then (after the completion of the data gathering from an online survey and a set of interviews) the user requirements were generated. These requirements provided for the following:

1. Supports the possibility of a three-tier E-Learning Model (section 2.5.4) created in the previous stage. For instance, users like to use both synchronous and asynchronous communication methods therefore, the communication management sub module has both synchronous and asynchronous types of communication. (see section 2.5.4.2.1). This model also provides the functionalities required to meet
multiple user requirements (for instance, it meets the requirements of video and audio files as well). Based on the data gathered and analysed, user requirements have been incorporated into the three-tier E-Learning model; and

2. To give support to the UML modeling. For instance, users like to use both synchronous and asynchronous communication, therefore, in the UML design, a use case that is called communication management needs to be created (see section 6.3.2.1).

In summary, through this research, Web 2.0 applications and techniques appear to have a large potential capability in the learning area (which has been called E-learning 2.0). However, in order to succeed, these applications must obtain positive feedback from end users, both learners and lecturers. However, the users’ perceptions of E-Learning 2.0 may be affected by different personal factors, like age range, gender, major studied, first language and even the level of IT experiences or the degree of technology acceptance. This was the reason for this research to be conducted and the data analysis was based on the criteria above.

Other findings need to be taken into consideration. No matter how good a new technology is, it is very important to have a full understanding of it prior to using it. Especially, the user needs to have a full knowledge of its weaknesses and advantages when compared with other technologies, because it is impossible to adapt to this new technology if there is not a good understanding about it. In this research, that is the reason for evaluating the common E-Learning systems (Blackboard and Moodle) and the common web 2.0 technologies (Wiki, Blog) and applications (Google applications, Facebook) to obtain the user requirements.

This study also explores the users’ requirements of E-Learning 2.0 (see section 5.1). According to Wang and Chiu (2011, p. 1791), E-Learning 2.0 displays features such as “interactive learning, collaborative learning, computer-mediated communication learning, and online discussion boards”. Those features are consistent with the users’ requirements that emerged from the survey and interviews and the three-tier model generated as a result. It is hoped that the UML modeling of this study may be used by other organizations or researchers. The potential value of the UML modeling may increase significantly through the emergence of initiatives such as model-driven development. Consequently, it may help developers generate executable systems automatically by using mapping functions.

This study presents a possible E-Learning 2.0 model (three-tier learning model). Compared with other study in the same area, for instance Liu, et al. (2010), this study emphasizes the features of E-Learning 2.0, which means user participation, interaction, communication and Personal Learning Environment (related to the co-operation and communication sub modules and personal learning environment in the teaching and learning sub module). The system architecture (see Figure 2.5.4 b) is consistent with the study of Liu, et al. (2010) and Wang, et al. (2009). A limitation of this study is that most respondents were international students (English is not their first language) and may not have understood all the survey questions. Also the interview and survey participants were not random samples. Therefore, this result may not totally reflect the requirements of all users. Another limitation of this research is that more emphasis may have been placed on the technical aspects of E-learning 2.0 rather than pedagogical processes because about 60% respondents are computing and engineering students. As a result, the user requirements may not be reflected well in the E-Learning system because of the limited scope of the respondents. Another limitation
is the small number of interviewees. In addition, it is a limitation of UML (although UML is a good tool to link with the users’ requirements and the system’s functions together) that sometimes it still cannot represent all users’ requirements. As pointed out by Sanchez and Monzon (2001, p. 2) “some building elements necessary in the real system cannot be considered by UML”. For instance, it is really hard for UML to represent their expectations about system security, stability, availability and flexibility. Such requirements can be addressed by adding appropriate features at a later stage of development of the e-learning 2.0 system.
Chapter VIII Reflection

Although there are only two stakeholders (lecturer and learner) who are involved in this research, the finding of this study are important for other E-learning stakeholders (school administration, system administration, school board). In an E-Learning 2.0 system, the same person may play other roles. For instance, after learners have registered, they become students, when students take tests, they become examinees, and when students create their personal learning spaces, they become system administrators or even examiners.

It was discovered in this research that all participants believed that Web 2.0 applications and techniques were very important and applying Web 2.0 in a learning system (E-Learning 2.0) will definitely improve the learning process. However the problem is that few of the participants had used these Web 2.0 features in their current learning. There are obvious advantages of E-Learning 2.0 like interaction, collaboration, and personal learning space but the disadvantages of E-Learning 2.0 are also obvious, for example lack of technical support and low security. Since the users do have clear requirements of E-Learning 2.0, why do the learning system providers not think to integrate current popular Web 2.0 applications or technologies into their systems? This research has discovered that most students have already made a lot of use of Web 2.0 services. It may seem that learning system providers just need to directly integrate Web 2.0 services into existing learning systems like Blackboard or WebCT. However, to integrate Web 2.0 into a current learning system may lead to other problems because of the unique character of Web 2.0.

The findings of study may generate other research questions, for instance, E-Learning 2.0 with its social character may cause a total change in learning, because learners are allowed to participate in the learning process as well as the creation of learning contents. This fact generates another problem that should be answered in future research: how do users utilize unauthorized or less-trusted learning materials in their learning?

Finally, the term “Web 2.0” probably is outdated now and will be replaced by “Web 3.0” in the next few years. Therefore, E-Learning 2.0 will not be a final version of E-learning systems. But there is one thing that cannot change, that is, with the development of internet technology, more and more new web technologies will be used in the learning area.
References


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Appendix 1

Figure appendix 1b types of learning styles

Figure appendix 1a Number of respondents in file mgmt
Appendix 2 Use case description

1.0 Communication management module

1.1 Access to synchronize & Asynchronous communication

**INTENT:**
In order to communicate with other user, the user is able to access this specific module

**OVERVIEW:**
The user is able to access the communication module

**PRE-CONDITIONS**
The windows of communication display to the user successfully

**POST-CONDITIONS**
1. User accesses to the communication management module.
2. After successful access to this module, the user is able to select the types of communications based on his or her requirements
MAIN FLOWS
1. Selects the communication management
2. If the user selects synchronize communication, all the ways of this type of communication are displayed
3. If the user selects asynchronous communication, all the ways of this type of communication are displayed

ALTERNATIVE FLOWS
2
There are three types of synchronize communication for the user to select, which are, email, discussion board and reminder message

3
There are two types of asynchronous communication for the user to choose, which are instant message and online chat room

EXCEPTION FLOWS
2
The system fails to load the “communication management” module or “communication types selection” functions

1.2 Email

INTENT:
In order to communicate with other user, the user is able to email other users

OVERVIEW:
The user is able to email other users

PRE-CONDITIONS
The windows of communication types are displayed to the user successfully

POST-CONDITIONS
The user is able to select the email option in the communication types window
After the user sends the email successfully, this will be recorded by the system automatically

MAIN FLOWS
1. User selects email option
2. User writes the email
3. User submit the request of sending email
4. System check the validation of sending user
5. System generate a record and display successful information
ALTERNATIVE FLOWS

2
If the user intends to attach a file, he or she can attach a file
If the user intends to attach more files, he can attach the more files

4
If the user enters the wrong user name or format, system informs the user and goes back to step 2

EXCEPTION FLOWS

2
The system fails to load the “communication type selection” function

5
The system fails to accept the user request
   A Display problems
   B Undo the data transaction
   C Return to 2

1.3 Discussion board

INTENT:
In order to communicate with other users, the user is able to use discussion board to communicate with other users

OVERVIEW:
The user is able to use discussion board to communicate with other users

PRE-CONDITIONS
The windows of communication types are displayed to the user successfully

POST- CONDITIONS
The user is able to select the discussion board option in the communication types window
After the user submit his or her operations successfully, system follows this command to conduct the related operation

MAIN FLOWS
1. User selects discussion board option
2. The system displays “discussion board” windows and four options that are, “create new topic”, “add comment”, “upload &download file” and “add external link” waiting for user to choose
3. User selects the one option and then submits the request
4. The system checks the validation and display the related information

ALTERNATIVE FLOWS
Four alternative flows are based on the user’s selection, those flows are “create new topic”, “add comment”, “upload & download file” and “add external link”.

If the system check is not validated, back to 2 and then inform the user.

**EXCEPTION FLOWS**

1. The system fails to load the “discussion board” function

4. The system fails to accept the user request
   - A Display problems
   - B Undo the data transaction
   - C Return to 2

### 1.4 Online Instant message

**INTENT:**
In order to communicate with other user immediately, the user is able to use instant message to communicate with other users.

**OVERVIEW:**
The user is able to send instant message to other users.

**PRE-CONDITIONS**
The windows of communication types is displayed to the user successfully.

**POST-CONDITIONS**
The user is able to select the instant message option in the communication types window.
After the user sends the instant message successfully, this will be recorded by the system automatically.

**MAIN FLOWS**
1. User selects instant message option
2. User writes the instant message
3. User enters or selects the name of sending user
4. User submits the request
5. The system checks the validation and displays the related information

**ALTERNATIVE FLOWS**

5. If the user enters the wrong user name, the system informs the user and goes back to step 3.
If the user enters the right user name and then do the data traction and informs the user.

**EXCEPTION FLOWS**

1. The system fails to load the “instant message” function
2. The system fails to accept the user request
   a. Display problems
   b. Undo the data transaction
   c. Return to 2

**1.5 Online chatting room**

**INTENT:**
In order to communicate with other user, the user is able to use online chatting room to communicate with other users.

**OVERVIEW:**
The user is able to use online chatting room to communicate with other users.

**PRE-CONDITIONS**
The windows of communication types is displayed to the user successfully.

**POST-CONDITIONS**
The user is able to select the online chatting room option in the communication types window.
The user selects any types of opinion in the online chatting room, and can communicate with other user.
This communication will be record by the system automatically.

**MAIN FLOWS**
1. User selects online chatting room option
2. User selects the related participants
3. User selects the method to conduct the communication
4. User submits the request and starts to chat

**ALTERNATIVE FLOWS**
3. The user is able to select three ways (audio, video and text) to conduct the chat
4. The user is able to terminate and to pause the chatting during the chatting.
The new participant must have the permission, and then can start to chat.
EXCEPTION FLOWS
1
The system fails to load the “instant message” function
3
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3

1.6 Online remind message

INTENT:
In order to communicate with other user, the user is able to send a message to other users

OVERVIEW:
The user is able to send a message to other users

PRE-CONDITIONS
The windows of communication types is displayed to the user successfully

POST- CONDITIONS
The user is able to select online remind message option in the communication types window
After sending a message successfully, this communication will be recorded by the system automatically

MAIN FLOWS
1. User selects online remind message
2. User writes the message
3. User selects or enter the relater receiver
4. User submits the request
5. System checks and validation and do the operation, inform the user

ALTERNATIVE FLOWS
5
If the user enters or selects the wrong receiver, informs the user
If the user enters or selects the right user, the system does the operation and displays successful information

EXCEPTION FLOWS
1
The system fails to load the “remind instant message” function
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3

2.0 Co-operative management module

2.1 Access to co-operative sub module

INTENT:
In order to manage the co-operative operations, the system provides this specific module.

OVERVIEW:
The user is able to access the co-operative management module.

PRE-CONDITIONS
The window of co-operative management is displayed to the user successfully.

POST-CONDITIONS
1. User accesses to the co-operative management module
2. After successful access to this module, the user is able to select the function modules inside the module based on his/her requirements.

MAIN FLOWS
1. Select the co-operative management module in the main menu
2. System displays the related sub modules, based on the user’s selection.

ALTERNATIVE FLOWS
2
   If the user selects co-user account management, the system displays all the functions in this module
   If the user selects co-Learning material management, the system displays all the functions in this module
   If the user selects co-PLE management, the system displays this window.

EXCEPTION FLOWS
2
The system fails to load the “co-operative management” module or one of any sub module.
2.2 co-user account management sub module

INTENT:
In order to manage the co-user account, the system provides this specific function to the user.

OVERVIEW:
The user is able to manage the co-user account by using this function.

PRE-CONDITIONS
The window of co-operative management is displayed to the user successfully.

POST-CONDITIONS
1. User access to the co-operative management module
2. After the user successful submits the command, the system follows the commands based on his or her requirements.

MAIN FLOWS
1. User selects the co-user account management sub module
2. User selects a course
3. User views all the co-user account of this course
4. User is able to operate the co-user account based on his/her requirements
5. User submits the request.
System conducts the validate check then informs the user and finally does the related operation.

ALTERNATIVE FLOWS
4
There are two options for the user to select, which are, add a new co-user account or select a existing co-user account.

6
If the request passes the system check, the system conducts the operation and then informs the user after successful completion.

If the request fails the system check, the system inform the user and then goes back to step 4.

EXCEPTION FLOWS
2
System fails to load the “co-operative management” module or co-user account sub module.
2.3 co-learning material management sub module

INTENT:
In order to manage the co-learning materials, the system provides this specific function for the user.

OVERVIEW:
The user is able to manage the co-learning materials by using this function.

PRE-CONDITIONS
The window of co-learning materials management is displayed to the user successfully.

POST- CONDITIONS
1. User access to the co-operative management module
2. After successful access to this module, the user is able to conduct the function modules inside module based on his/ her requirements.

MAIN FLOWS
1. User selects the co-operative learning material management sub module
2. User selects a course
3. User views all the co-learning materials of this course
4. User is able to operate the co-learning materials based on his /her requirements
5. User submits the request
6. The system conducts the validate check then informs the user and finally does the related operation.

ALTERNATIVE FLOWS
4
There are two options for the user to select, which are, add a new co-learning materials or select an existing co-learning materials

6
If the request passes the system check, the system conducts the operation and then informs the user after successful completion,

If the request fails the system checks, the system informs the user and then goes back to step 4.

EXCEPTION FLOWS
2
The system fails to load the “co-operative management” module or co-operative learning material sub module.
2.4 Co-PLE management sub module

INTENT:
In order to manage the co-PLE, the system provides this specific function for the user.

OVERVIEW:
The user is able to manage the co-PLEs by using this function.

PRE-CONDITIONS
The window of co-PLE management is displayed to the user successfully.

POST-CONDITIONS
1. User access to the co-PLE management module
2. After successful access to this module, the user is able to conduct the function modules inside module based on his/her requirements.

MAIN FLOWS
1. User selects the co-PLE management sub module
2. User selects a course
3. User views all the co-PLE of this course
4. User is able to operate the co-PLE based on his/her requirements
5. User submits the requests
6. The system conducts the validate check then informs the user and finally does the related operation.

ALTERNATIVE FLOWS
4
There are two options for the user to select, which are, add a new co-PLE or select a existing co-learning materials

6
If the request passes the system check, the system conducts the operation and then informs the user after successful completion.

If the request fails the system check, the system informs the user and then goes back to step 4.

EXCEPTION FLOWS
2
System fails to load the “co-operative management” module or “co-PLE” sub module.
3.0 File management module

3.1 Access to file management sub module

**INTENT:**
In order to manage the files, the system provides this specific module.

**OVERVIEW:**
The user is able to access file management module and conducts the related operations.

**PRE-CONDITIONS**
The window of file management is displayed to the user successfully.

**POST-CONDITIONS**
1. User accesses the file management module
2. After successful access to this module, the user is able to select the function modules inside module based on his/her requirements.

**MAIN FLOWS**
1. User selects the file management module in the main menu
2. If user selects file category, the system displays all the functions of this module
3. If user selects file selection, the system displays all the functions of this module
4. If user selects file upload, the system displays all the functions of this module
5. If user selects file searching, the system displays this window.

**ALTERNATIVE FLOWS**
3. There are five options for the user to choose, which are, file remove, file share, file update, file download and view the file contents.

**EXCEPTION FLOWS**
2. The system fails to load the “file management” module or one any sub module.

3.2 File uploading

**INTENT:**
In order to operate files, the user must upload the files to system.
OVERVIEW:
When the users intend to use a file, they need to upload the file, after successful upload, the files must be recorded in the system and file name must appear in the system.

PRE-CONDITIONS
The file loading system is displayed to the user successfully
The user is able to upload the file format based on the system requirements.

POST-CONDITIONS
1. User access to file management module and the file name must be appeared
2. After completion of the uploading, the file is stored in the system.

MAIN FLOWS
1. The user goes to the system main interface
2. The user selects the “file management” option
3. The user selects the “file uploading” function
4. The user selects the files that intend to upload
5. The user submits the request
6. The system accepts the file, categories the type and stores the files and generated a record in the system.

ALTERNATIVE FLOWS
5.
   a. If the files uploading are not correct, go back to step 3 and give the user reminder information
   b. If the files uploading are correct, the system will display the successful message to the user.

EXCEPTION FLOWS
2. The system fails to load the “file management” module or “file uploading” functions
The system fails to store the uploading file
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.

3.3 File category

INTENT:
In order to manage the files, the user needs to group the file based on the system category.

OVERVIEW:
When the users intend to manage a file, they need to classify the file.
PRE-CONDITIONS
The window of file category is displayed to the user successfully
The user is able to categories the file based on the system required.

POST-CONDITIONS
1. User accesses the file management module and the file name must appear
2. After completion of categorization, the file is stored in the system based this selection.

MAIN FLOWS
1. The user selects the “file category” function
2. The user selects the files and the related the group that intend to category
3. The user submits the request
4. The system accepts the file, category the type and stores the files.

ALTERNATIVE FLOWS
4.
   a. If the files categorisazied are not correct, goes back to step 3 and give the user reminder information
   c. If the files categorized are correct, the system will display the successful message to the user.

EXCEPTION FLOWS
1.
   The system fails to load the “file management” module or “file category” functions
4.
The system fails to categorized file
   a Display problems
   b Undo the data transaction
   c Return to 3.

3.4 File selection

INTENT:
In order to operate the files, the user needs to make selections from the file list.

OVERVIEW:
When the users intend to operate the file, they need to select a file.

PRE-CONDITIONS
The file manager window is displayed to the user successful
The user is able to select the file from the file list.

POST-CONDITIONS
1. User access the file management module and the file manager window must appear
2. After completion of the selection, the user is able to conduct further operations based on his/her requirements.

**MAIN FLOWS**
1. The user selects the “file manager”
2. The user selects the files
3. The user submits the request
4. The system does the valid the check and then conducts the related operations.

**ALTERNATIVE FLOWS**
4.
If the user successfully selects the files, there are five options for the user to choose, which are file remove, file share, file download, file update and view file contents

If the user request passes the system check, the system displays option window
If the user request fails system check, the system informs the user and goes back to step 2.

**EXCEPTION FLOWS**
1. The system fails to load the “file management” module or “file manager” functions
2. The system fails to select file	a. Display problems
   b. Undo the data transaction
   c. Return to 3.

3.4.1 File downloading

**INTENT:**
The user is able to download the files from system.

**OVERVIEW:**
The user is able to download the file.

**PRE-CONDITIONS**
The file downloading system is displayed to the user successfully
The user is able to download the file based on the system requirements.

**POST-CONDITIONS**
1. User access to file management module and the file name must be appear
2. After completion of the downloading, the system must be able to track the file.
MAIN FLOWS
1. The user goes the system main interface
2. The user selects the “file management” option
3. The user selects the “file downloading” function
4. The user selects the files that intend to download
5. The user submits the request
6. The system accepts the user requirements, and downloads the files.

ALTERNATIVE FLOWS
6
a. If the files downloading are not correct, goes back to step 3 and give the user reminder information
b. If the files downloading are correct, the system will display the successful message to the user and generated a record in the system.

EXCEPTION FLOWS
1 & 2
The System fails to load the “file management” module or “file downloading” functions.

The System fails to store the downloading file
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.

3.4.2 File sharing

INTENT:
In order to conduct co-operative or group works, the user is able to share files.

OVERVIEW:
The user is able to share files.

PRE-CONDITIONS
The window of file sharing is displayed to the user successfully
The sharing file must be in the list
The share user must register in the system.

POST- CONDITIONS
1. User access the file management module and the file name must appear
2. After completion of the sharing, the system is able to record the details operations of file (like sharing time, related the user).

MAIN FLOWS
1. The user selects the “file management” option
2. The user selects or enters the files that intend to share
3. The user selects “file share” function
4. The user selects or enters the users who want to share
5. The user submits the request
6. The system does the valid check and then conducts the related operations.

ALTERNATIVE FLOWS
6
If the user enters the wrong file name, the system informs the user then redo the operation

If the user enters the wrong user name, the system informs the user then redo the operation

If the user enters the correct user name as well as the file, the system will display the successful message to the user.

EXCEPTION FLOWS
1
System fails to load the “file management” module or “file sharing” functions

6
System fails to share the file
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.

3.4.3 File remove

INTENT:
The user is able to remove the files from system.

OVERVIEW:
The user is able to remove the file.

PRE-CONDITIONS
The file remove function is displayed to the user successfully
The user is able to remove the file based on the system requirements

POST- CONDITIONS
1. User access to file management module and the file name must be appear
2. After completion of the removing, the file must be able to remove from the system and the system must be able to track the file

MAIN FLOWS
1. The user selects the “file removing” function
2. The system displays all the files
3. The user selects the files that intend to remove
4. The user submits the request
5. The system asks the user whether to remove
6. The system conducts the operation based on the user’s decision

ALTERNATIVE FLOWS
5
a. If the user ensures to remove, the system starts to remove the file. After completion of removing, inform the user
b. If the user does not intend to remove, goes back to step 2

EXCEPTION FLOWS
1
The System fails to load “file removing” functions

6.
The System fails to download file
a. Display problems
b. Undo the data transaction
c. Return to 3

3.4.4 File view & update

INTENT:
The user is able to update the contents of the files in the system.

OVERVIEW:
The user is able to update the contents of file.

PRE-CONDITIONS
The file update window is displayed to the user successfully
The user is able to update the file based on the system requirements

POST-CONDITIONS
1. User access to file management module and the file name must be appear
2. After completion of the updating, the file must be able to update of the system and the system must be able to track the file
3. After completion of the updating, the user is able to view the updating contents

MAIN FLOWS
1. The user selects the “file updating” function
2. The system displays all the files
3. The user selects the files
4
   a. user view the content
   b. user update the content
5. The user submits the request
6. The system ask the user whether to update
7. The system conduct the operation based on the user’s decision

ALTERNATIVE FLOWS

6
   a. If the user ensures to update, the system starts to update the file. After completion of updating, inform the user
   b. If the user does not intend to remove, goes back to step 2

EXCEPTION FLOWS

1
The System fails to load “file view & updating” functions

6
The System fails to update & view file
   a. Display problems
   b. Undo the data transaction
   c. Return to 3

3.4.5 File move

INTENT:
The user is able to move the internal file to another location in the system.

OVERVIEW:
The user is able to move the file.

PRE-CONDITIONS
The file move window is displayed to the user successfully
The user is able to move the file based on the user requirements

POST-CONDITIONS
1. User access to file management module and the file name must be appear
2. After completion of the moving, the file must be able to move the right location and the system must be able to track the file
3. After completion of the moving, the user is able to view file appeared in the new location

MAIN FLOWS
   1. The user selects the “file moving” function
   2. The system displays all the files
3. The user selects the file
4. The user submits the request
5. The system ask the user whether to move
6. The system conduct the operation based on the user’s decision

ALTERNATIVE FLOWS
6
a. If the user ensures to move, the system starts to move the file. After completion of moving, inform the user
b. If the user does not intend to move, goes back to step 2

EXCEPTION FLOWS
1
The System fails to load “file move” functions

6
The System fails to the update & view file
a. Display problems
b. Undo the data transaction
c. Return to 3

3.5 File searching

INTENT:
In order to find the files, the user needs to search the file from the file list.

OVERVIEW:
User is able to search the file in the file list.

PRE-CONDITIONS
The file searching window is displayed to the user successful
The user is able to search the file from the file list.

POST- CONDITIONS
1. User access to file searching sub module
2. After completion of the searching, the searching result must display.

MAIN FLOWS
1. The user selects the “file searching”
2. The user enters the key words
3. The user submits the request
4. The system does the valid the check, then return the result.
ALTERNATIVE FLOWS
4
If the user request passes the system check, display the result
If the user request fails system check, the system informs the user and back to step 2.

EXCEPTION FLOWS
1
System fails to load the “file management” module or “file searching” sub module
4
System fails to select file
   b. Display problems
   b. Undo the data transaction
   c. Return to 2.

3.6 Folder creation

INTENT:
In order to store the files, the user needs to create the folder based on their requirements.

OVERVIEW:
User is able to create a folder.

PRE-CONDITIONS
The folder creating window is displayed to the user successful
The user is able to create the folder

POST- CONDITIONS
1. User access to folder creation sub module
2. After completion of the creating, the folder must display in the system.

MAIN FLOWS
1. The user selects the “folder creation”
2. The user enters the folder name
3. The user submits the request
4. The system does the valid the check, then the folder must display in the system.

ALTERNATIVE FLOWS
4 If the user request passes the system check, create the folder and display in the system
If the user request fails system check, the system informs the user and back to step 2.

EXCEPTION FLOWS

1 System fails to load the “file management” module or “folder creation” sub module

4 System fails to select file
   a. Display problems
   b. Undo the data transaction
   c. Return to 2.

4.0 Course management module

4.1 Access to course management sub module

INTENT:
In order to manage the course, the system provides this specific module.

OVERVIEW:
The user is able to access course management module.

PRE-CONDITIONS
The window of course management is displayed to the user successfully.

POST- CONDITIONS
1. User access the course management module
2. After successful access this module, the user is able to select the function modules inside module based on his/her requirements.

MAIN FLOWS
1. User selects the course management module in the main menu
2. If user selects course development, the system displays all the functions in this module
3. If user selects virtual class mgr, the system displays all the functions in this module
4. If user selects course online evaluation, the system displays this window.

ALTERNATIVE FLOWS
2 There are five options for the user to select, which are upload new course material, remove old course
material, add external link, update course description, and view user feedback.

3. There are three options for the user to choose, which are course material mgr, real-time virtual class mgr and question & answer mgr.

**EXCEPTION FLOWS**
2. The system fails to load the “course management” module or one of any sub module.

### 4.2 Course development

**INTENT:**
In order to develop the course, the system provides this specific function for user.

**OVERVIEW:**
The user is able to develop any one of course by using this function.

**PRE-CONDITIONS**
The windows of course management is displayed to the user successfully.

**POST- CONDITIONS**
1. User access the course management module.
2. After successful access this module, the user is able to select the function modules inside module based on his/her requirements.

**MAIN FLOWS**
1. User selects the course development sub module
2. After user select course development, system displays all the functions in this module.

**ALTERNATIVE FLOWS**
2. There are five options for the user to select, which are, upload new course material, remove old course material, add external link, update course description, and view user feedback.

**EXCEPTION FLOWS**
2. The system fails to load the “course management” module or one of any sub function.
4.3 Online virtual classroom

INTENT:
In order to manage the online course, the system provides this specific function for user.

OVERVIEW:
The user is able to manage any one of online course by using this function.

PRE-CONDITIONS
The windows of online virtual classroom display to the user successfully.

POST- CONDITIONS
1. User accesses the course management module
2. After successful access to this module, the user is able to manage any one of the online virtual classroom.

MAIN FLOWS
1. User selects the online virtual classroom sub module
2. After user select online virtual classroom, display all the functions in this module.

ALTERNATIVE FLOWS
2
There are four options for the user to choose, which are course classification mgr, course material mgr, real-time online class mgr and question & answer mgr.

EXCEPTION FLOWS
2
The system fails to load the “course management” module or “online real-time virtual classroom”.

4.3.1 Course classification management

INTENT:
In order to categorize the online course, the system provides this specific function for user.

OVERVIEW:
The user is able to categorize any one of online courses by using this function.

PRE-CONDITIONS
The windows of online virtual classroom is displayed to the user successfully.

POST- CONDITIONS
After successful classification, the course is able to locate in the suitable category based on the user
requirements.

MAIN FLOWS
1. User selects the course classify
2. 
   a. User selects a course
   b. User selects a category type
3. User submits the request
4. The system conducts the validate check and then takes the related the operation.

ALTERNATIVE FLOWS
2
   a. user can select more than one course
   b. user can add a new category

4
If the request fails the system validation check, informs the user and goes back to 2
If the request passes the system check, informs the user and do the operation.

EXCEPTION FLOWS
1
The system fails to load the “virtual classroom” sub module
4
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 2.

4.3.2 Course materials management

INTENT:
In order to manage the whole online course material, the system provides this specific function for user.

OVERVIEW:
The user is able to manage the whole online learning course material by using this function.

PRE-CONDITIONS
The window of online course material management is displayed to the user successfully.

POST-CONDITIONS
The system conducts the operations based on user command like add, remove, update, search, share, and category
The learning material will be added, removed, searched, shared, categories after successfully execution.
MAIN FLOWS
1. User selects the course material sub module
2. User selects a course material
3. a. User selects and then views the answer
   b. User selects and the views the question
   c. User adds the question
4. User conducts the operations based on his /her requirements
5. User submits the request
6. System conducts the validate check and then takes the relate the operation.

ALTERNATIVE FLOWS
2
User can conduct the add, remove, update, search, category and share
6
If the request fails the system validation check, inform the user and goes back to 2
If the request passes the system check, informs the user and do the operation.

EXCEPTION FLOWS
1
The system fails to load the “virtual classroom” sub module
5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to step3.

4.3.3 Online virtual class management

INTENT:
In order to manage the whole online virtual class, the system provides this specific function for user.

OVERVIEW:
The user is able to online virtual class by using this function.

PRE-CONDITIONS
The window of online virtual classroom is displayed to the user successfully.

POST- CONDITIONS
The system conducts the operations based on user command like add, remove, and update, categorized
The virtual class will be added, removed, categories after successfully execution.
MAIN FLOWS
1. User selects the online virtual class management sub module
2. User selects a virtual class management
3. User conducts the operations based on their requirement
4. User submits the request
5. The system conducts the validate check and then takes the relate the operations.

ALTERNATIVE FLOWS
2
User can conduct the operation of add, remove, category
5
If the request fails the system validation check, informs the user and goes back to 2
If the request passes the system check, informs the user and do the related operation.

EXCEPTION FLOWS
1
The system fails to load the “virtual classroom” sub module
5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to step3.

4.3.4 Question and Answer management

INTENT:
In order to manage the question and answer, the system provides this specific function for user.

OVERVIEW:
The user is able to manage question and answer by using this function.

PRE-CONDITIONS
The window of online virtual classroom is displayed to the user successfully.

POST-COMDITIONS
The system conducts the operations based on user command like add, remove
The question and answer will be added, removed after successfully execution.

MAIN FLOWS
1. User selects the question and answer sub module
2. User selects a course
3. User conducts the operations based on their requirement
4. User submits the request
5. System conducts the validate check and then takes the relate the operation.
ALTERNATIVE FLOWS
2
User can conduct the operation of add, remove
5
If the request fails the system validation check, inform the user and back to 2
If the request passes the system check, informs the user and takes the related operations.

EXCEPTION FLOWS
1
The system fails to load the “question & answer” sub module
5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to step3.

4.4 Course evaluation

INTENT:
In order to evaluate the course, the system provides this specific function for user.

OVERVIEW:
The user is able to evaluate course by using this function.

PRE-CONDITIONS
The window of course evaluate is displayed to the user successfully.

POST- CONDITIONS
1. User accesses the courses evaluate sub module.
2. After successful access to this module, the user is able to evaluate any one of course
3. After the completion of evaluation, the new course and related material can be displayed.

MAIN FLOWS
1. User selects the course evaluate sub module
2. User selects one course
3. User fills in the online evaluate form
4. User submits the request
5. The system checks the validation and conducts the related the operations.

ALTERNATIVE FLOWS
5
If the request fails the system validation check, informs the user and goes back to 3.
If the request passes system check, informs the user and takes the related operation.

**EXCEPTION FLOWS**

1. The system fails to load the “course evaluate” function
5. The system fails to accept the user request
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.

5.0 **Student learning process management module**

5.1 **Access to student learning process management sub module**

**INTENT:**
In order to control the process of student learning, the system provides this specific module.

**OVERVIEW:**
The user is able to conduct the learning process.

**PRE-CONDITIONS**
The window of learning process control management is displayed to the user successfully.

**POST-CONDITIONS**
1. User access the learning process control management module
2. After successful access this module, the user is able to select the function modules inside this module based on their requirement.

**MAIN FLOWS**
1. User selects the learning process control management module in the main menu
2. The system displays all the sub module
   a. If user selects personal learning space, display all the functions in this module
   b. If user selects virtual classroom, display all the functions in this module
   c. If user selects collaborative platform, display all the functions of this window
   d. If user selects learning kit, display all the functions of this window
3. User selects the one of the sub module and submits the request
4. System displays the sub module based on the user selection.
ALTERNATIVE FLOWS

2a
There are two options for the user to select, which are, create & manage personal learning space

2b
There are four options for the user to select, which are online real-time class, assessment & exercise, online testing and learning resource management

2c
There are three options for the user to select, which are class forum, docs and podcasting

2d
There are three options for the user to select, which are instant message, search engine and Tag.

EXCEPTION FLOWS

2
The system fails to load the “learning process control management” module or one of any sub module.

5.2 Personal learning space

5.2.1 Personal learning environment creation

INTENT:
In order to conduct the online E-learning, the user is able to create the personal learning environment.

OVERVIEW:
The user is able to create own personal learning environment.

PRE-CONDITIONS
The personal learning environment sub module is displayed to the user successfully.

POST-CONDITIONS
1. User accesses the learning process control management module.
2. After completion of the personal learning environment, the user is able to access and conduct the some operations of online learning
3. The system conducts the operations based on the user's command.

MAIN FLOWS
1. The user selects the function of “personal learning environment create”
2. The user enters the name of personal learning environment
3. The user selects the property of personal learning environment
4. The user submits the request
5. The system accepts the user request and the user is able to access this environment and conduct the online learning operations.

ALTERNATIVE FLOWS
2
If the user enters the wrong name, the system informs the user then does the operation
If the user enters the correct name, the system stores the name and displays property windows

3
If the user does not select any property, the system informs the user then does the operation
If the user selects the properties, the system displays the successful message to the user.

EXCEPTION FLOWS
2
The system fails to load the “learning process management” module or “personal learning environment” functions
5
The system fails to create the personal learning environment
  a. Display problems
  b. Undo the data transaction
  c. Return to 3.

5.2.1 Personal learning environment management

INTENT:
In order to manage the user own Personal learning environment, the system provides this function module.

OVERVIEW:
The user is able to manage own personal learning environment.

PRE-CONDITIONS
The personal learning environment sub module is displayed to the user successfully.

POST- CONDITIONS
1. User accesses the Personal learning environment sub module
2. The system is able to conduct the operations of personal learning environment such as add, remove, block user and remove Personal learning environment based on the user’s requirements.

MAIN FLOWS
1. The user selects the function of “personal learning environment manage”
2. The system displays all the personal learning environment
3. The user selects the a personal learning environment
4. The user conducts the related operation
5. The user submits the request
6. The system checks the validation and conducts the related operations.

ALTERNATIVE FLOWS
2
If the user does not select the personal learning environment, the system informs the user and goes back to step 3

6
If the request fails the system validation check, informs the user and goes back to step 4
If the request passes the system check, informs the user and does the operation based on the user’s command.

EXCEPTION FLOWS
1
The system fails to load the “learning process management” module or “personal learning environment” functions
6
The system fails to accept the user command
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.

5.3 virtual classroom

5.3.1 Online real time class

INTENT:
In order to conduct the online E-learning, the user is able to participate online real-time class.

OVERVIEW:
The user is able to participate online real-time class.

PRE-CONDITIONS
The user must have the privilege to take the class
The window of online real-time class is displayed to the user successfully.

POST-CONDITIONS
1. User accesses the learning process control management module.
2. After the participation of class, the user is able to ask & answer the questions, then and download the class files.

**MAIN FLOWS**
1. The user selects the sub module of “Virtual classroom”
2. The user selects the function of “online real-time class”
3. The user selects the one class
4. The user submits the request
5. The system accepts the user request and the user is able to participant the online class and conducts some related operation.

**ALTERNATIVE FLOWS**
3
If the request of user is rejected by the lecturer, the systems informs the user then goes back to step 2
If the request of user is accepted by the lecturer, the user is able to take part in the online class
5
If the request of the user to stop the class has been accepted, the online class is over
If the request of the user for downloading the class video file has been accepted, the user can start to download the file
If the request of use for asking & answering the question has been accepted, the system starts the Question & answer function.

**EXCEPTION FLOWS**
1
The system fails to load the “virtual classroom” module, or “online real-time class” sub module.

5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3.

### 5.3.2 Assessment &exercise

**INTENT:**
In order to assess and conduct a class exercise for the user, the system provides this function module.

**OVERVIEW:**
The user is able to assess the user and conduct the class exercise.

**PRE-CONDITIONS**
The window of virtual classroom is displayed to the user successfully.

**POST-CONDITIONS**
After the user submits the request, the system can conduct the related operation based on the user requirement.

**MAIN FLOWS**
1. User selects assessment & exercise sub module
2. User selects any functions in the sub module
3. User submits the requests
4. The system checks the validation and informs the user
5. The system conducts the operation based on the user command.

**ALTERNATIVE FLOWS**
2
There are four options waiting for the user to choose, these options are view assignment & exercise, submit assignment & exercise, view result, participant the class exercise and assignment & exercise management

4
If the request passes the system check, the system does the operation and then informs the user
If the request cannot passes, the system informs the user and goes back to step 2.

**EXCEPTION FLOWS**
1
The system fails to load the “assessment & exercise” function
5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3.

**5.3.3 Online testing**

**INTENT:**
In order to test the learner, the system provides this specific function for user.

**OVERVIEW:**
The user is able to conduct the online testing by using this function.

**PRE-CONDITIONS**
The windows of online testing display to the user successfully.
POST-CONDITIONS
1. User access the online testing sub module.
2. After successful access to this module, the user is able to take the online testing
3. After the completion of testing, the user is able to submit and then view the result later.

MAIN FLOWS
1. User selects the online testing sub module
2. User selects one testing
3. The system conducts the validate check to ensure the user have the privilege to access
4. User takes the online testing
5. User submits the result of online testing
6. The system conducts the validate check, then conducts the related operations and informs the user.

ALTERNATIVE FLOWS
3
If the request fails system check, the system informs the user and goes back to step 2
If the request passes system check, the system informs the user and goes to step 4

4
If the user intends to hold the online exam, then he/she can conduct this operation, after that he/she can continue the exam or end the exam

6
If the request fails the system check, the system informs the user and goes back to step 5
If the request passes the system check, the system informs the user and finishes the testing.

EXCEPTION FLOWS
1
The system fails to load the “online testing” function

3
User cannot hold the test

6
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3.

5.3.4 Learning resource management

INTENT:
In order to manage the learning resource, the system provides this specific function for user.

**OVERVIEW:**
The user is able to manage the learning resource by using this function.

**PRE-CONDITIONS**
The window of learning resource management is displayed to the user successfully.

**POST-CONDITIONS**
1. After successful access this module, the user is able to manage the learning resource
2. The system is able to conduct the command based on the user selection.

**MAIN FLOWS**
1. User selects the learning resource management sub module
2. User selects one course
3. User views the learning material of this course
4. User selects the operations according to their expectation
5. User submits request
6. System conducts the validate check, then conduct the related operations and informs the user.

**ALTERNATIVE FLOWS**
4
The user can select from six options that are uploading, downloading, remove, search, share and update

6
If the request fails the system check, informs the user and goes back to step 4
If the request passes the system check, informs the user and does the related operations.

**EXCEPTION FLOWS**
1
System fails to load the “learning resource management” function

2
User can not select the course

3
User cannot view the learning materials

6
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3.
5.4 Collaborative platform

5.4.1 Group Forum

**INTENT:**
In order to communicate with another user, the system provides a group forum for the user to communicate with each other.

**OVERVIEW:**
The user is able to communicate with each other by using group forum.

**PRE-CONDITIONS**
The windows of collaborate platform is displayed to the user successfully.

**POST- CONDITIONS**
The user can add or remove the comment for the topic
The user can upload, download or remove the files
The user can add or remove the user account
The user can create or remove the topic
After user submits the request, the system can conduct the operation based on the user requirements.

**MAIN FLOWS**
1. User selects group forum sub module
2. User conducts the operation in the group forum based on their requirement
3. User submits the requests
4. The system checks the validation and informs the user
5. The system conducts the operation based on the user command.

**ALTERNATIVE FLOWS**
2
Four options waiting for the user to choose are user account management, file management, topic management and comment management

4
If the request passes the system check, the system does the operation and then informs the user
If the request cannot pass, the system informs the user and goes back to step 2.

**EXCEPTION FLOWS**
1
The system fails to load the “Group forum” function
5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3.

5.4.2 Class docs

INTENT:
In order to share the files with another user, the system provides class docs for the user to share with each other.

OVERVIEW:
The user is able to share the files with each other.

PRE-CONDITIONS
The window of collaborate platform is displayed to the user successfully.

POST- CONDITIONS
The user can select the files from the list
The user can select or enter the another user name
After the user submits the request, the another share user can have the privilege to access and edit the file.

MAIN FLOWS
1. User selects the class docs
2. User selects the files in the list
3. User selects the share function
4. User enters or selects the user name
5. User submits the request
6. The system conducts the validation check and then conducts the related operations.

ALTERNATIVE FLOWS
5
If the user enters the wrong name, the system informs the user and then goes back to 4

If the user enters the right name, the system displays successful information.

EXCEPTION FLOWS
1
The system fails to load the “class docs” function
5.4.3 Class podcasting

**INTENT:**
In order to podcast the files with other user, the system provides podcasting.

**OVERVIEW:**
The user is able to podcast the file.

**PRE-CONDITIONS**
The window of collaborate platform is displayed to the user successfully.

**POST- CONDITIONS**
The user can select the files from the list
After user submits the request, the other user can access the file.

**MAIN FLOWS**
1. User selects the podcasting function
2. User selects the files for podcasting
3. User submits the request
4. The system checks the validation and conduct the related operation.

**EXCEPTION FLOWS**
1. The system fails to load the “class podcasting” function

4. The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 2.
5.5 Learning kit

5.5.1 Online instant message

(The details can be seen in appendix 1.0, 1.6 instant messages).

5.5.2 Learning material search engine

INTENT: In order to find suitable learning materials, the user is able to search the learning materials based on his/her requirement.

OVERVIEW: The user is able to search the learning materials.

PRE-CONDITIONS
The windows of learning Kit is displayed to the user successfully.

POST-CONDITIONS
The user is able to enter the key words in the searching text box. After user submits the request, the system can return the result based on the user typing keyword.

MAIN FLOWS
1. User selects learning material search
2. User enters the keywords in the searching text box
3. User submits the request
4. The system conducts the user query
5. The system returns the result.

ALTERNATIVE FLOWS
5
If the system finds the results match with the user’s keyword, the system display the result.
If the system cannot find the result, the system informs the user.

5.5.3 Learning material tag

INTENT:
In order to classify the learning material, the user is able to categorise the learning materials based on his/her requirements.

OVERVIEW:
The user is able to categorise the learning material or creates a new type category for the learning material.

PRE-CONDITIONS
The window of learning Kit is displayed to the user successfully.

POST-CONDITIONS
The user is able to select a tag from the default tag list
The user is able to create a type tag
After user create new type tag, this type must display in the default tag list
After user add a learning material into tag, this learning material must appear under this type tag.

MAIN FLOWS
1. User selects the learning material tag
2. User selects a learning material
3. User selects a suitable tag from the default tag list
4. User submits the request
5. The system checks the validation and then conducts the related operations.

ALTERNATIVE FLOWS
3
If user cannot search for a suitable tag, he/she can create a new type

5
If the system check cannot pass, go back to 3.

EXCEPTION FLOWS
1
The system fails to load the “learning material tag” function

5
The system fails to accept the user request
   a Display problems
   b Undo the data transaction
   c Return to 3.
6.0 Teaching process management module

6.1 Access to teaching process management sub module

INTENT:
In order to control the process of teaching, the system provides this specific module.

OVERVIEW:
The user is able to conduct the teaching process.

PRE-CONDITIONS
The window of teaching process control management is displayed to the user successfully.

POST- CONDITIONS
1. User accesses the teaching process control management module.
2. After successful access this module, the user is able to select the function modules inside module based on his/her requirements.

MAIN FLOWS
1. User selects the teaching process control management module in the main menu
2. The system displays all the sub module
   a. If user selects personal teaching space, display all the functions in this module
   b. If user selects virtual classroom, display all the functions in this module
   c. If user selects learning kit, display all the functions of this window
3. User selects the one of the sub module and submits the request
4. The system displays the sub module based on the user selection.

ALTERNATIVE FLOWS
2a
There are two options for the user to select, which are, user account management and space setting

2b
There are four options for the user to select, which are, online real-time class, assessment & exercise, question & answer and teaching resource management

2c
There are three options for the user to select, which are grade book, search engine, email and Tag.

EXCEPTION FLOWS
2
The system fails to load the “teaching process control management” module or one of any sub module.
6.2 Teaching environment setting

INTENT:
In order to manage and setting the user own teaching environment, the system provides this function module.

OVERVIEW:
The user is able to manage and setting the teaching environment.

PRE-CONDITIONS
The teaching environment sub module display to the user successfully.

POST- CONDITIONS
1. User accesses the teaching environment sub module
2. The system is able to conduct the operations of personal learning environment such as add & remove, user account and add & remove the properties of teaching space.

MAIN FLOWS
1. The user selects the “teaching environment manage”
2. The system displays all the window of teaching environment
3. The user selects the property or user account
4. The user conducts the related operations (add & remove user account, or add & remove property)
5. The user submits the request
6. The system checks the validation and conducts the related operations.

ALTERNATIVE FLOWS
2
If the user does not select the property or user account, the system informs the user and goes back to step 3

6
If the request fails the system validation check, the system informs the user and goes back to step 4

If the request passes the system check, the system informs the user and does the operation.

EXCEPTION FLOWS
1
The system fails to load the “teaching process management” module or “teaching environment setting” sub module

6
The system fails to accept the user command
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.

6.3 virtual classroom

6.3.1 Real-time online teaching

See the details in 5.3.1 for this section.

6.3.2 Teaching resource management

See the details of 5.3.4 for this section.

6.3.3 Question and Answer

See the details of 7.0 for this section.

6.3.4 Assessment management

See the details of 5.3.2 for this section.

6.4 Teaching Kit

6.4.1 Searching engine

See the details of 5.4.2 for this section
6.4.2 Grade book

INTENT:
In order to manage the grade of user, the system provides this function module.

OVERVIEW:
The user is able to add or remove the grade.

PRE-CONDITIONS
The teaching kit sub module is displayed to the user successfully.

POST-CONDITIONS
1. User accesses the teaching kit sub module
2. The system is able to conduct the operations such as add, remove the grade of user based on the users’ requirements
3. After add a record successfully, this record is stored in the system and then the related user is able to view.

MAIN FLOWS
1. The user selects the “teaching kit”
2. The system is displayed all the window of teaching kit
3. The user selects a course
4. The user conducts the related operations (add & remove user grade)
5. The user submits the request
6. The system check the validation then conducts the related operations.

ALTERNATIVE FLOWS
2
If the user does not select one of available course, the system informs the user and goes back to step 3.

6
If the request fails the system validation check, the system informs the user and goes back to step 4
If the request passes system check, the system informs the user and does the operation.

EXCEPTION FLOWS
1
The system fails to load the “teaching process management” module or “teaching kit” sub module

6
The system fails to accept the users’ command
   a. Display problems
   b. Undo the data transaction
   c. Return to 3.
6.4.3 Tag

See the details of 5.4.3 for this section.

6.4.4 Email

See the details of 1.0 communication, 1.2 Email for this section.

7.0 Question and answer management module

INTENT:
In order to manage the question and answer, the system provides this specific module.

OVERVIEW:
The user is able to access question and answer management module.

PRE-CONDITIONS
The window of question and answer is displayed to the user successfully.

POST- CONDITIONS
1. User is able to access to question and answer module
2. The system is able to display all the questions based on the user course selection
3. User is able to conduct the operation according to the requirement such as question add & remove, comment add, file upload & download.
4. After the user submits the command, the system is able to conduct the operation
5. After the system successfully completes or fails the commands of user, the system informs the user.

MAIN FLOWS
1. User accesses the question and answer module.
2. User selects one course
3. The system displays all the questions of this course
4. User selects one question or add a new question
5. User conducts the operations based on his/her own requirements
6. User submits the request
7. The system conducts the validation check then does the related operations and finally informs the user.

ALTERNATIVE FLOWS
There are two options for the user to select, which are add a new question or select an existing question.

If the request passes the system check, the system conducts the operation and then informs the user after successful completion.

If the request fails the system check, the system informs the user and then goes back to step 5.

**EXCEPTION FLOWS**

1. The system fails to load the “Question and answer” module

7. The system fails to accept the user request
   a. Display problems
   b. Undo the data transaction
   c. Return to 4.

---

### 8.0 Online exam management module

**INTENT:**

In order to manage the online exam, the system provides this specific module.

**OVERVIEW:**

The user is able to access online exam management module.

**PRE-CONDITIONS**

The window of online exam management is displayed to the user successfully.

The user has the privilege to access or create the exam.

**POST-CONDITIONS**

1. User is able to online exam management module
2. The system is able to display all the exams based on the user course selection
3. User is able to conduct the operations according to the requirement such like exam add & remove, update, user account management.
4. After the user submits the command, system is able to conduct the operation and after successfully completion or failing, the system informs the user.

**MAIN FLOWS**

1. User accesses the online exam management module
2. User selects one course
3. The system displays all the exams of this course
4. User selects one exam or add a new one
5. User conducts the operations based on their own requirement
6. User submits the request
7. System conducts the validation check then does the related operations and finally informs the user.

ALTERNATIVE FLOWS
4
There are two options for the user to select, which are add a new exam or select a old exam

7
If the request passes the system check, the system conducts the operation and then informs the user after successful completion

If the request fails the system check, the system informs the user and then goes back to step 5.

EXCEPTION FLOWS
1
The system fails to load the "exam management" module

7
The System fails to accept the user request
  a Display problems
  b Undo the data transaction
  c Return to 4.
Appendix 3  Activity diagram
1.0 Communication management

1.1 Types of communication selections

Figure 1.1 Accesses to different types of communication
1.2 Email

Figure 1.2 Email
1.3 Discussion board

Figure 1.3 Discussion board
1.4 Online remind message

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select online remind message</td>
<td></td>
</tr>
<tr>
<td>Display online remind message window</td>
<td></td>
</tr>
<tr>
<td>Write the message</td>
<td></td>
</tr>
<tr>
<td>Select &amp; enter the user</td>
<td>Not valid</td>
</tr>
<tr>
<td>Submit the request</td>
<td></td>
</tr>
<tr>
<td>User validate check?</td>
<td>valid</td>
</tr>
<tr>
<td>Display successful message</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.4 Online remind message
1.5 Online chatting Room

Figure 1.5 Online chatting room
1.6 Online instant message

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select online instant message sending</td>
<td>Display online instant message window</td>
</tr>
<tr>
<td>Write the message</td>
<td></td>
</tr>
<tr>
<td>Select or enter the user</td>
<td></td>
</tr>
<tr>
<td>Submit the request</td>
<td></td>
</tr>
<tr>
<td>User validate check?</td>
<td></td>
</tr>
<tr>
<td>Valid</td>
<td></td>
</tr>
<tr>
<td>Unvalid</td>
<td></td>
</tr>
<tr>
<td>Sending the message and display the successful information</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1.6 Online instant message
2.0 Co-operative management module

2.1 Access to co-operative management sub module

Figure 2.1 Accesses to co-operative management module
2.2 Co-user account management sub module

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select co-user account management sub module</td>
<td></td>
</tr>
<tr>
<td>Display co-user account window</td>
<td></td>
</tr>
<tr>
<td>Select one course</td>
<td></td>
</tr>
<tr>
<td>View the Co-operative user account</td>
<td></td>
</tr>
<tr>
<td>Add new co-user account?</td>
<td></td>
</tr>
<tr>
<td>System validate check</td>
<td></td>
</tr>
<tr>
<td>Inform the user</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.2 Co-user account management
2.3 Co-learning materials management sub module

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select co-learning material management</td>
<td></td>
</tr>
<tr>
<td>Display co-learning material window</td>
<td></td>
</tr>
<tr>
<td>Select one course</td>
<td></td>
</tr>
<tr>
<td>View the learning materials</td>
<td></td>
</tr>
<tr>
<td>Add new co-learning material?</td>
<td>Remove co-learning material</td>
</tr>
<tr>
<td>Submit the request</td>
<td></td>
</tr>
<tr>
<td>System validate check</td>
<td>Valid</td>
</tr>
<tr>
<td>Inform the user</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.3 Co-learning materials management
2.4 Co-PLE management sub module

Figure 2.4 Co-PLE management
3.0 File management

3.1 access to sub module of file management

Figure 3.1 Accesses the file management sub module
3.2 File upload

![Diagram showing the file upload process]

**Figure 3.2 File uploading**
3.3 File category

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select file category sub module</td>
<td>Display file category window</td>
</tr>
<tr>
<td>Select a file</td>
<td>Category the file?</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Update time</td>
</tr>
<tr>
<td></td>
<td>File types</td>
</tr>
<tr>
<td></td>
<td>Course name</td>
</tr>
<tr>
<td></td>
<td>More files selection</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Submit the request</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Valid check</td>
</tr>
<tr>
<td></td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>Inform the user</td>
</tr>
</tbody>
</table>

Figure 3.3 File category
3.4 File selection

User  

- Select the file manager option

E-Learning system

- Display file manager window
- Select the file
- View the file list
- Submit the request

Decision:
- More file selection?
  - Yes
  - No

Validation:
- Validate check
  - Valid
  - Inform the user

Figure 3.4 File selection
3.4.1 File download

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose &quot;Download&quot;</td>
<td></td>
</tr>
<tr>
<td>Display download screen</td>
<td></td>
</tr>
<tr>
<td>ChooseTitle</td>
<td></td>
</tr>
<tr>
<td>Download</td>
<td>Show file details (size, type)</td>
</tr>
<tr>
<td></td>
<td>Show duration of download</td>
</tr>
<tr>
<td></td>
<td>successful?</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Show download successful information</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 3.4.1 File downloading activity diagrams
3.4.2 File Sharing

File sharing activity diagrams
### 3.4.3 File remove

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display all the files</td>
<td>Valid check</td>
</tr>
<tr>
<td>Select one file</td>
<td>Valid</td>
</tr>
<tr>
<td>Submit the remove requirement</td>
<td>Remove?</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Remove the file</td>
</tr>
<tr>
<td></td>
<td>Display the information</td>
</tr>
</tbody>
</table>

Figure 3.4.3 file remove
3.4.4 File view & update

User

Select the file

Display the file list

Submit the request

E-Learning

View

Update?

Open contents

Inform the user

Ensure update

Yes

Valid check

Valid

Figure 3.4.4 file view & update
3.4.4 File move

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Display file list</td>
</tr>
<tr>
<td></td>
<td>Select a file</td>
</tr>
<tr>
<td></td>
<td>Select or enter new location</td>
</tr>
<tr>
<td></td>
<td>Valid?</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>File moved</td>
</tr>
<tr>
<td></td>
<td>Display in the new location</td>
</tr>
</tbody>
</table>

Figure 3.4.5 file move
3.5 File searching

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the file searching</td>
<td>Display file searching window</td>
</tr>
<tr>
<td>Enter the key words</td>
<td>System check valid Inform the user</td>
</tr>
<tr>
<td>Submit the request</td>
<td>Display the result</td>
</tr>
</tbody>
</table>

Figure 3.5 File searching
3.5 Folder creation

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select folder creation</td>
<td></td>
</tr>
<tr>
<td>Display folder creation window</td>
<td></td>
</tr>
<tr>
<td>Enter the name of folder</td>
<td></td>
</tr>
<tr>
<td>Submit the request</td>
<td>System check</td>
</tr>
<tr>
<td></td>
<td>Inform the user</td>
</tr>
<tr>
<td></td>
<td>Valid</td>
</tr>
<tr>
<td></td>
<td>Create the folder</td>
</tr>
<tr>
<td></td>
<td>Display the folder</td>
</tr>
</tbody>
</table>

Figure 3.6 Folder creation
4.0 Course management module

4.1 Access to course management sub module

![Diagram of course management module access]

Figure 4.1 Accesses the course management module

4.2 Course Development

![Diagram of course development process]

Figure 4.2 Course development
4.3 Online real-time virtual classroom mgr

4.3.1 Course classification management
4.3.2 Course materials management

![Course materials management diagram]

Figure 4.3.2 Course material mgr
4.3.3 Online virtual class management

Figure 4.3.2 Online virtual classroom mgr
4.3.4 Online Question and answer management

Figure 4.3.4 Online question and answer mgr
4.4 course evaluation

Figure 4.4   Course evaluation
5.0 Student learning process management module

5.1 Access to student learning process management sub module

Figure 5.0   Student learning process management
5.2 User personal learning environment

5.2.1 Personal learning environment creation

Select "Personal Learning environment create" option

Display "Personal Learning Environment create" windows

enter the name of personal learning environment

Select the option of personal learning environment

Submit the request

Validation check

Display successful information

5.2.1 Personal learning environment creation
5.2.2 Personal learning environment manage

Figure 5.2.2 Personal learning environment manage
5.3 Virtual classroom

5.3.1 Online real-time class
Figure 5.3.1 Online real-time class

Select "online realtime class" list window

Select one class

Submit the request

Accept by lecturer?

Display "online realtime class" list window

Display decline information

Display successful information

Start the online class

Yes

Question into the queue

Accept by lecturer?

Answer the question

Any more questions?

No

Any Question?

Download the files

Download class?

Terminate class?

Class continue

class Over?

Yes

No

No

No

No

No

No

No

Yes

Yes

Yes

Yes
5.3.2 Assessment and exercise

Figure 5.3.2 Assessment and exercise
5.3.3 Online testing participation

<table>
<thead>
<tr>
<th>User</th>
<th>E-learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Online testing function</td>
<td>Display online testing window</td>
</tr>
<tr>
<td>Select one testing</td>
<td>Hold testing?</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No error</td>
</tr>
</tbody>
</table>

Figure 5.3.3 Online testing
5.3.4 Learning resource management

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select learning material management</td>
<td>Display learning material management window</td>
</tr>
<tr>
<td>Select one course</td>
<td></td>
</tr>
<tr>
<td>View the learning materials</td>
<td></td>
</tr>
<tr>
<td>Download</td>
<td>Upload</td>
</tr>
<tr>
<td>Upload</td>
<td>Download, Update, Search, Share</td>
</tr>
<tr>
<td>Remove</td>
<td></td>
</tr>
<tr>
<td>Submit the request</td>
<td>Validate check (\text{Valid}) Inform the user</td>
</tr>
</tbody>
</table>
5.4 Collaborative platform

5.4.1 Class forum

Figure 5.4.1 Forum
5.4.2 Class docs

User | E-learning system
---|---
Select class docs function | Display class docs window
Select a docs | 
select the share | 
Enter or select user name | Unvalid
Submit the request | Check valid
Inform the user | 

Figure 5.4.2 Class docs
5.4.3 Class podcasting

![Diagram of Class podcasting process]

**5.5 learning Kit**

**5.5.1 Instant message**

(The details can be seen in appendix 1.0, 1.6 instant messages)
5.5.2 Search

Figure 5.5.2 Search engine
5.5.3 Learning tag

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select learning material tag</td>
<td></td>
</tr>
<tr>
<td>Display learning material tag window</td>
<td></td>
</tr>
<tr>
<td>Select one learning material</td>
<td></td>
</tr>
<tr>
<td>Looking for a suitable learning tag</td>
<td></td>
</tr>
<tr>
<td>Select one type</td>
<td></td>
</tr>
<tr>
<td>Suitable default type tag?</td>
<td>create a new type tag</td>
</tr>
<tr>
<td>No</td>
<td>Add into one default type tag</td>
</tr>
<tr>
<td>Submit the request</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.5.3 Learning tag
6.0 Teaching process control management

6.1 Access to sub module of teaching process control management

Figure 6.1 Accesses the sub module of teaching control management
6.2 Teaching space setting

![Diagram of teaching space setting](image)

Figure 6.2 Teaching space setting

6.3 Virtual classroom

6.3.1 Real-time online teaching

See the details in 5.3.1 for this section

6.3.2 Teaching resource management

See the details of 5.3.4 for this section
6.3.3 Question and Answer

See the details of 7.0 for this section

6.3.4 Assessment management

See the details of 5.3.2 for this section

6.4 Teaching Kit

6.4.1 Searching engine

See the figure of 5.4.2 for this section
### 6.4.2 Grade Book

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select grade book</td>
<td></td>
</tr>
<tr>
<td>Display grade book window</td>
<td></td>
</tr>
<tr>
<td>Select a course</td>
<td></td>
</tr>
<tr>
<td>View grade</td>
<td></td>
</tr>
<tr>
<td>Add new grade?</td>
<td>Yes</td>
</tr>
<tr>
<td>Add a new record into grade book</td>
<td>Yes</td>
</tr>
<tr>
<td>Continue to add?</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td>End add?</td>
<td>Yes</td>
</tr>
<tr>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Display message</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

Figure 6.4.2 Grade book

### 6.4.3 tag

See the figure of 5.4.3 for this section

### 6.4.4 Email

See the figure of 1.2 for this section
7.0 Question and answer management module

Figure 7.0  Question and answer management module
8.0 Online exam management module

---

<table>
<thead>
<tr>
<th>User</th>
<th>E-Learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select exam mg sub module</td>
<td>Display exam mg window</td>
</tr>
<tr>
<td>Select one available course</td>
<td></td>
</tr>
<tr>
<td>Exam create</td>
<td>Select Exam</td>
</tr>
<tr>
<td>Yes</td>
<td>View exam context</td>
</tr>
<tr>
<td>Yes</td>
<td>Remove exam</td>
</tr>
<tr>
<td>Yes</td>
<td>Update exam</td>
</tr>
<tr>
<td>Yes</td>
<td>User account mg</td>
</tr>
<tr>
<td>Valid check</td>
<td>Yes</td>
</tr>
<tr>
<td>Submit the request</td>
<td></td>
</tr>
</tbody>
</table>

Figure 8.0 Online Exam mg
Appendix 4 Information Sheet

I am a student enrolled in UNITEC’s Master of Computing Programme and I am completing my thesis. My name is Ning Wei. Part of our degree programme involves a research paper on a subject of our choice. My research topic looks at the requirements of users who are involved in E-Learning. In particular, I want to find a suitable model for an E-learning 2.0 system. I would like to invite you to participate in my research project by answering this online survey. It will take about 20 minutes. Completing the survey will be taken as consent to have the anonymous data used in my research.

What will it mean for you?
If you are a Facebook user, then you will not be asked for an interview. You will say "no" to the last survey question.
The participants who say “yes” to the last survey question (“Would you be willing to be interviewed for half an hour, please email ninghuiwei@hotmail.com?”) will be invited to come for an interview at a time and place that will suit you after completing the online survey.

There are 22 survey questions. It will take about 20 minutes to complete the survey.

Please consider that the participants on Facebook will not be invited to come for interviews. Therefore, if you are a participant of Facebook, you will not need to read the information below.

Consent
Completing this research survey is taken as consent to participate in the research project. If you agree to be interviewed, you will be asked to sign a consent form. This does not stop you from changing your mind if you wish to withdraw from the project. You may also withdraw your contribution within 2 weeks after your interview.

Confidentiality
The transcription of interview tapes will be done by the researcher. If any other person is asked to transcribe the tapes this person will be required to sign a confidentiality statement.

Your name and any information that may identify you will be kept completely confidential. Participants can quit if they wish before the research has been accomplished. The data will be stored in a secure place and only the researcher and his supervisors can access the data. The participants’ name and information will be kept confidential and nothing in the thesis will enable them to be identified.
In order to produce valid results, any data collected from the questionnaire in the desired sample will be treated objectively and will not be omitted. The questionnaire does not impinge on the participants’ intellectual or cultural property.

Please contact me if you need more information about the project. At any time if you have any concerns about the research project you may contact one or both my supervisors.
My supervisors are Dr Xiaosong Li, 815 4321x6019, xli@unitec.ac.nz and Dr Abdolhossein Sarrafzadeh, 8154321x 6040, hsarrafzadeh@unitec.ac.nz

UREC REGISTRATION NUMBER: (2010-1130)
This study has been approved by the UNITEC Research Ethics Committee from (10th December 2010) to (9th December 21st December 2011). If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 6162. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

Appendix 5 Consent form

This consent form will help obtain information for a research project looking at prototyping and testing an E-learning 2.0 System.
I have had the research project explained to me and I have read and understand the information sheet given to me.
I understand that I don't have to be part of this if I don't want to and I may withdraw within 2 weeks after the interview.

I understand that everything I say is confidential and none of the information I give will identify me and that the only persons who will know what I have said will be the researcher and their supervisor. I also understand that all the information that I give will be stored securely on a computer at Unitec for a period of 5 years.

I understand that my discussion with the researcher will be taped and transcribed.

I understand that I can see the finished research document.

I am aware that I may contact the Research Supervisor, Dr Xiaosong Liat Unitec, (09) 815-4321 ext. 6019, if I have any queries about the project.

I have had time to consider everything and I give my consent to be a part of this.

Participant Signature: …………………………..  Date: ……………………….

Project Researcher: ……………………………….  Date…………………………..
Appendix 6 Online query

1. E-learning online query

I am a student enrolled in UNITEC’s Master of Computing Programme and completing my thesis. My name is Ning Wei. Part of my degree programme involves a research paper on a subject of our choice. My research topic looks at the requirements of users who are involved in E-Learning. In particular, I want to find a suitable model for E-learning 2.0 system. I would like to invite you to participate in my research project by answering this online survey. It will take about 20 minutes. Completing the survey will be taken as consent to have the anonymous data used in my research.

What will it mean for you?

If you are a Facebook user, then you will not be asked for an interview. You will say “no” to the last survey question. The participants who say “yes” to the last survey question (“Would you be willing to be interviewed for half an hour, please email ningwei@hotmai.com?”) will be invited to come for an interview at a time and place that will suit you after completing the online survey.

There are 22 survey questions. It will take about 20 minutes to complete the survey.

Please consider that the participants on Facebook will not be invited to come for interviews. Therefore, if you are a participant of Facebook, you will not need to read the information below.

Consent

Completing this research survey is taken as consent to participate in the research project. If you agree to be interviewed, you will be asked to sign a consent form. This does not stop you from changing your mind if you wish to withdraw from the project. You may also withdraw your contribution within 2 weeks after your interview.

Confidentiality

The transcription of interview tapes will be done by the researcher. If any other person is asked to transcribe the tapes this person will be required to sign a confidentiality statement.

Your name and any information that may identify you will be kept completely confidential. Participants can quit if they wish before the research has been accomplished. The data will be stored in a secure place and only the researcher and his supervisors can access the data. The participants’ name and information will be kept confidential and nothing in the thesis will enable them to be identified.

In order to produce valid results, any data collected from the questionnaire in the desired sample will be treated objectively and will not be omitted. The questionnaire does not impinge on the participants’ intellectual or cultural property.

Please contact me if you need more information about the project. At any time if you have any concerns about the research project you may contact one or both my supervisors.

My supervisors are Dr Xiaosong Li, 815-4321x6010, xil@unitec.ac.nz and Dr Abdolhosein Samadzadeh, 8154321x 8040, hasamadzadeh@unitec.ac.nz

UREC REGISTRATION NUMBER: (2010-1130)

This study has been approved by the UNITEC Research Ethics Committee from (10th December 2010) to (9th December 21st December 2011). If you have any complaints or reservations about the ethical conduct of this research, you may contact the Committee through the UREC Secretary (ph: 09 815-4321 ext 6162. Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

* 1. Please select your gender

- [ ] Male
- [ ] Female
2. Please select your age range
- 18-20
- 21-30
- 31-40
- More than 40

3. Is English your first language?
- Yes
- No

4. Which type of institution do you currently study at?
- University
- Polytechnic/Institute of technology
- Other (please specify)

5. Which major do you currently study?
- Arts
- Business
- Computing
- Engineering
- Science
- Other (please specify)

6. Please specify the general features you expect in an E-learning system?
- Co-operative working
- Information & resource distribution
- Ease of use
- Flexibility
- Open source
- Personal learning environment
- Other (please specify)
7. Please rate your Computer and Internet Experience (from 1 which means "no experience" to 7 which means "highly experienced")

- Using Web browsers
- Using e-mail
- Using MS Office packages
- Coding Web pages

8. Please select the E-learning style you prefer

- Teacher centered learning
- Student centered learning
- Both
- Other (please specify)

9. Please rate the applications below as being useful in E-learning

- Blackboard
- Facebook
- Google applications
- Moodle
- MSN
- Myspace
- Picasa
- Second Life
- YouTube

10. Please rate the technologies below as being useful in E-learning

- Blogging
- Forum
- WEKU

11. How many hours per week do you spend on the applications in question 9

- Below 10
- 10-19
- 20-29
- Over 29
- Other (please specify)
### 12. Please select the features that you think each of the following applications have

<table>
<thead>
<tr>
<th>Application</th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative learning</th>
<th>Free of cost</th>
<th>Concurrency control</th>
<th>Virtualized environments</th>
<th>Personalised environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Facebook</td>
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<tr>
<td>Google apps</td>
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<tr>
<td>Moodle</td>
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<tr>
<td>MSN</td>
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<tr>
<td>MySpace</td>
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<tr>
<td>Podcast</td>
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<tr>
<td>Second Life</td>
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<tr>
<td>YouTube</td>
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</tr>
</tbody>
</table>

### 13. Please select the features that you think each of the following technologies have

<table>
<thead>
<tr>
<th>Technology</th>
<th>Not used</th>
<th>Ease of use</th>
<th>Co-operative learning</th>
<th>Free of cost</th>
<th>Concurrency control</th>
<th>Virtualized environments</th>
<th>Personalised environments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogging</td>
<td></td>
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</tr>
<tr>
<td>Forum</td>
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<tr>
<td>WIKI</td>
<td></td>
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</tr>
</tbody>
</table>

### 14. Please select the features of the following applications below that you do not like

<table>
<thead>
<tr>
<th>Application</th>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with common use application such as MS Office</th>
<th>Not have enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Facebook</td>
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<tr>
<td>Google apps</td>
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<td>Moodle</td>
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<td>MSN</td>
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<td>MySpace</td>
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<tr>
<td>Podcast</td>
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<tr>
<td>Second Life</td>
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<tr>
<td>YouTube</td>
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</tr>
</tbody>
</table>

### 15. Please select the features of the following technologies below that you do not like

<table>
<thead>
<tr>
<th>Technology</th>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with common use application such as MS Office</th>
<th>Not have enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blogging</td>
<td></td>
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<tr>
<td>Forum</td>
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<tr>
<td>WIKI</td>
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</tr>
</tbody>
</table>
3.

16. Please rate the usefulness of the main functions related to assessment. (from 1 "useless" to 5 "very useful")

<table>
<thead>
<tr>
<th>Function</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment &amp; Assignment submission</td>
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<tr>
<td>Grade book</td>
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<tr>
<td>Online testing</td>
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<tr>
<td>Other (please specify)</td>
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</tr>
</tbody>
</table>

17. Please rate the usefulness of the main functions related to Course management. (from 1 "useless" to 5 "very useful")

<table>
<thead>
<tr>
<th>Function</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course materials management</td>
<td></td>
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<tr>
<td>Course information searching</td>
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<tr>
<td>Course classification</td>
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<tr>
<td>Course evaluation &amp; development</td>
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<tr>
<td>Course deletion</td>
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<tr>
<td>Other (please specify)</td>
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</tbody>
</table>

18. Please rate the usefulness of the main functions related to Communication management. (from 1 "useless" to 5 "very useful")

<table>
<thead>
<tr>
<th>Function</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>Address Book</td>
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<tr>
<td>Email</td>
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<tr>
<td>Mobility</td>
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<tr>
<td>Online chat room</td>
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<tr>
<td>Online message</td>
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<tr>
<td>Other (please specify)</td>
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</tbody>
</table>
19. Please rate the usefulness of the main functions related to co-operative working. (from 1 “useless” to 5 “very useful”)

<table>
<thead>
<tr>
<th>Function</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concurrency control editing</td>
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<tr>
<td>Group page &amp; community</td>
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<tr>
<td>Mobility</td>
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<tr>
<td>Online chat room</td>
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<td>Online message</td>
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<tr>
<td>Resource distribution &amp; sharing</td>
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<tr>
<td>Other (please specify)</td>
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</table>

20. Please rate the usefulness of the main functions related to File management. (from 1 “useless” to 5 “very useful”)

<table>
<thead>
<tr>
<th>Function</th>
<th>1</th>
<th>2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>File uploading</td>
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<tr>
<td>File downloading</td>
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<td>File type transfer</td>
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<tr>
<td>File classification</td>
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<td>File sharing</td>
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<tr>
<td>File deletion</td>
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<tr>
<td>Other (please specify)</td>
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</tbody>
</table>

21. Please rate the usefulness of the main functions related to Learning management. (from 1 “useless” to 5 “very useful”)

<table>
<thead>
<tr>
<th>Function</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning resource management</td>
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<tr>
<td>Learning resource searching</td>
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<tr>
<td>Learning resource distribution &amp; sharing</td>
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<tr>
<td>Online Chat room</td>
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<td>Online message</td>
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<tr>
<td>Personal learning environment</td>
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<tr>
<td>Other (please specify)</td>
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</tbody>
</table>

22. If you are willing to be interviewed for half an hour, please email ninghuiwe@hotmail.com

- Yes
- No
Appendix 7 Interview questions

In case of E-Learning 2.0, which E-learning types are suitable? (student-centric, teacher-centric, others)

What the features of Blackboard and Moodle are used for e-learning [in your courses]?
2 mins

Which features are the most useful? 2 mins

Which web 2.0 applications would you like to use for e-learning and what for?
3 mins

What are the advantages of using Blackboard and Moodle? 5 mins

What are the disadvantages of using Blackboard and Moodle? 5 mins

How can Web 2.0 applications improve E-learning? What are they? 5 mins

What features and the reasons do you want in an E-learning system? 2 mins
Appendix 8 Publications

Publication 1: Students and Some Teachers' Views of Using Web 2.0 Technologies in E-Learning: Findings from a Survey and Interviews

To be submitted to ICELF (International Conference E-Learning Future-2011)

Ning Wei  
Department of Computing  
Unitec Institute of Technology  
Auckland, New Zealand  
ninghuiwei@hotmail.com

Xiaosong Li  
Department of Computing  
Unitec Institute of Technology  
Auckland, New Zealand  
xli@unitec.ac.nz

Hossein Sarrafzadeh  
Department of Computing  
Unitec Institute of Technology  
Auckland, New Zealand  
hsarrafzadeh@gw.unitec.ac.nz
Abstract—Web 2.0 technologies have brought many changes to the teaching and learning process. What are students’ attitudes to the changes? Are they willing to make the changes? Are they ready to the changes? Are they well equipped to the changes? What are their expectations of a Web 2.0 based e-learning systems? Students and their teachers’ views should help to answer these questions. An online questionnaire and formal interviews were conducted among the NZ tertiary students and some of their teachers.

The majority of participants have very positive attitudes towards Web 2.0 based e-learning systems. They display really high willingness and enthusiasm to use Web 2.0. They have a good understanding about Web 2.0 technologies and are familiar with using Web 2.0 techniques. However, they still feel challenge to the new features of Web 2.0, particularly in creating new contents. They expect to retain those good features from traditional e-learning systems in Web 2.0 based e-learning systems.

Keywords-component; e-learning; Web 2.0; New Zealand; tertiary students; features; knowledge

Introduction

A traditional web-based e-learning system, for example Blackboard, usually can help teacher to deliver teaching materials, can help students to communicate with their teachers and their peers via email or online chatting. It also allows simple online assessments such as multi choice questions with simple feedbacks such as marks or simple comments. These systems are usually more passive rather than active, less creative, reflective, collaborative and personalised. Modern educational theories, for instance, socio-constructivism that means knowledge transmission depends on the individual uses’ participations and reconstructions. Similarly, Bruner (1996) indicated that learning can be considered as a kind of social process and it happens by sharing information and interactions in each user. Teachers should continue to explore new and dynamic ways of providing excellent pedagogical opportunities (Wheeler, 2009). With the arrival of the Web 2.0 technology, transformation of knowledge, overcoming the limitations of language and the loss of context that inevitably occurs when knowledge is captured and stored, web-based e-learning systems become more effective, more creative and more collaborative. The key idea of the Web 2.0 based e-learning systems is collaboration, which allows students collaboratively work on one piece of work or collaboratively participate in one activity (Husband, J. & Bair, J. 2007). For example, a number of students could work on one article collaboratively with the effective communication within a wiki environment. When this is combined with typical Web 2.0 features such as visualisation, real-time synchronisation and artificial intelligence, a Web 2.0 based e-learning system will greatly improve students’ learning and significant promote student centred learning (X. Cui et al. 2004, S. Liaw et al. 2008).

Web 2.0 based collaboration can be reflected in several aspects of actual pedagogical scenarios, for example, Blog is able to obtain the feedbacks
from others or express personal own opinions (Yinling, 2011), Social network services (SNS, e.g. Facebook, YouTube) is capable of improvement of communication between each people (Peter & Daniel, 2011), and based on the opinion of GaoFeng & Jing (2010), Google Docs is an easy-to-use online office package that includes word processor, spreadsheet and presentation editor that enables the students to create, store and share instantly and securely, and collaborate online in real time. These have brought many changes to the teaching and learning process. For example, people who have mostly been readers in a traditional e-learning system will start authoring content. For the first time, consumers of the media are also able to become producers. User generated content has proliferated to such an extent that vast storehouses of media elements are now instantly available as resources to anyone who has access to the system (Wheeler, 2009). If teachers have been authoring content in a traditional e-learning system, students haven’t. This is a significant change to the students. What are their attitudes to the changes? Are they willing to make the changes? Are they ready to the changes? Are they well equipped to the changes? What are their expectations of a Web 2.0 based e-learning systems?

Students and their teachers’ views should help to answer these questions. An online questionnaire and formal interviews were conducted among the NZ tertiary students and some of their teachers. The questions of online query and interview involve the experiences and perception to use Web 2.0 based applications and a couple of traditional e-learning systems on ease of use, advantages and disadvantages, perceived useful or usefulness. These will help to obtain the responds and feedbacks of the degree of familiarity of those people within different Web 2.0 tools, as well as the habits of usage. Then, the study will address the purposes of those students to use Web 2.0. And finally, the study will conduct the analysis then make related the conclusion.

The paper is organized as follows: section 2 presents the context of the study. The findings of survey are described in detail in section 3. Section 4 presents some discussions and lessons learned from our study. And finally, the section 5 concludes with the whole study.

**Study Context**

2.1 Participants

The study was distributed to two main groups, NZ Unitec students who are currently taking post graduate studies in computing (84) and participants of a Facebook community who are studying computing at other tertiary providers in NZ (198). All users were experienced with web 2.0 applications and common learning management systems. 84 participants returned a
valid response, with 35 being female and 45 male. Participation in this study was voluntary.

In addition, only Unitec participants were interviewed. The participants interviewed include 6 lecturers and 6 post graduate computing students. All of these participants were experienced with BlackBoard, Moodle and common Web 2.0 applications like WiKi, Blog, SNS(Social network service like Facebook, YouTube), IM (Instant message like MSN, Skype) that indicated that the internet was the part of their daily life. More particularly, one of the lecturers was employed in a learning centre, one was doing technical support for Moodle and the rest of the participants were current lecturers. Most participants were computing students, with an age range 21 to 30 and were people whose first language was not English.

2.2 Method

Firstly, all the participants were requested to fill in an online questionnaire in term of their use of Web in general and Web 2.0 applications in their daily life. Therefore from December 2010 to Feb 2011 (totally about 16 weeks), students follow the questions to contribute their opinions. Meanwhile, formal interview conducts among the NZ Unitec master of computing students and staffs. This result of interview reflects the experiences of using traditional e-learning system (Blackboard and Moodle) and personal attitude towards to Web 2.0 applications in learning (teaching) areas.

Result

3.1 Student’ familiarity with Web 2.0

<table>
<thead>
<tr>
<th>Application</th>
<th>Not used</th>
<th>Very poor</th>
<th>Poor</th>
<th>Ok</th>
<th>Good</th>
<th>Excellent</th>
</tr>
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<td>Blackboard</td>
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<td>2</td>
<td>37</td>
<td>14</td>
<td>5</td>
</tr>
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<td>3</td>
<td>4</td>
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<td>Google apps</td>
<td>6</td>
<td>0</td>
<td>4</td>
<td>19</td>
<td>33</td>
<td>12</td>
</tr>
<tr>
<td>Moodle</td>
<td>31</td>
<td>0</td>
<td>4</td>
<td>23</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>MSN</td>
<td>14</td>
<td>3</td>
<td>3</td>
<td>37</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>MySpace</td>
<td>36</td>
<td>1</td>
<td>5</td>
<td>18</td>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>Second life</td>
<td>49</td>
<td>0</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>YouTube</td>
<td>15</td>
<td>0</td>
<td>2</td>
<td>19</td>
<td>29</td>
<td>9</td>
</tr>
<tr>
<td>Blogging</td>
<td>13</td>
<td>3</td>
<td>4</td>
<td>17</td>
<td>32</td>
<td>6</td>
</tr>
<tr>
<td>Forum</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>14</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td>Wiki</td>
<td>8</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>40</td>
<td>15</td>
</tr>
</tbody>
</table>
The applications rated as most useful were Google, YouTube, Blackboard, Facebook and MSN. Myspace is declining in popularity worldwide and Second life is not widely used. As for Blogging, Forum and WiKi, these three Web 2.0 technologies are rated positively by 80% to 90% of respondents.

3.2 Reasons of students to choose Web 2.0 and e-learning system

Most participants believed YouTube, Google Application, Blackboard and Facebook were easy to use, 35 participants thought Google application was good for co-operative learning and 32 participants believed it had a good capability in concurrency control. Facebook had the most respondents in a virtualized environment (21) and had a personalized environment feature (40), and YouTube had the most respondents in “ease of use” feature. Myspace is declining in popularity worldwide. Secondlife and Moodle are not widely used.

As for Blogging, Forum and WiKi, most participants considered these three technologies were easy to use and free of cost. A clear majority of participants considered that Forum enabled co-operative learning and around half considered that Blogging and Wiki enabled co-operative learning. Only a minority considered that these three technologies provided concurrency control and virtualized environments. Most participants considered that Blogging provided personalized environments whereas about one third considered Forum and Wiki provided personalized environments.

<table>
<thead>
<tr>
<th></th>
<th>Easy of use</th>
<th>Co-operative</th>
<th>Free of cost</th>
<th>Concurrency</th>
<th>Virtualized</th>
<th>Personalized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>Not used</td>
<td>17</td>
<td>28</td>
<td>34</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Facebook</td>
<td>Not used</td>
<td>13</td>
<td>39</td>
<td>15</td>
<td>8</td>
<td>21</td>
</tr>
<tr>
<td>Google Apps</td>
<td>Not used</td>
<td>11</td>
<td>44</td>
<td>36</td>
<td>49</td>
<td>32</td>
</tr>
<tr>
<td>Moodle</td>
<td>Not used</td>
<td>10</td>
<td>22</td>
<td>22</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>MSN</td>
<td>Not used</td>
<td>16</td>
<td>35</td>
<td>29</td>
<td>46</td>
<td>10</td>
</tr>
<tr>
<td>Myspace</td>
<td>Not used</td>
<td>41</td>
<td>20</td>
<td>25</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Second life</td>
<td>Not used</td>
<td>55</td>
<td>12</td>
<td>13</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>YouTube</td>
<td>Not used</td>
<td>15</td>
<td>46</td>
<td>26</td>
<td>52</td>
<td>8</td>
</tr>
<tr>
<td>Blogging</td>
<td>Not used</td>
<td>13</td>
<td>42</td>
<td>37</td>
<td>47</td>
<td>9</td>
</tr>
<tr>
<td>Forum</td>
<td>Not used</td>
<td>7</td>
<td>44</td>
<td>47</td>
<td>47</td>
<td>13</td>
</tr>
<tr>
<td>Wiki</td>
<td>Not used</td>
<td>7</td>
<td>51</td>
<td>40</td>
<td>59</td>
<td>15</td>
</tr>
</tbody>
</table>

3.3 Reasons of students not to choose Web 2.0 and E-Learning system

Reasons of students not to choose Web 2.0 applications were obvious in Table III. In the case of Facebook, nearly one third of the participants thought it was difficult to control information and it did not have enough
functions for academic use. The participants also considered that it was “not compatible with common use application”. The main perceived disadvantage of Google application was that it was “not compatible with common use application (MS Office)” the same as other applications. The participants did not like the technical supports that were provided by Facebook”, “MSN” and “YouTube”. Finally, about 79.5% of respondents had not experience second life before and about one in third respondents had not used Moodle.

However, as for Blogging, Forum and WiKi, most participants selected all the criteria and consider these as the disadvantages. But, Blogging has the highest number of respondents in “difficult to control information” (33), forum and WiKi both are the No 1 in “lack of technical support” (31), and for WiKi has the second score in “difficult to control information” (31).

<table>
<thead>
<tr>
<th>Table III. Reasons of student not to choose Web 2.0 and E-learning system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not used</td>
</tr>
<tr>
<td>Bulletin Board</td>
</tr>
<tr>
<td>Facebook</td>
</tr>
<tr>
<td>Google Apps</td>
</tr>
<tr>
<td>Moodle</td>
</tr>
<tr>
<td>MSN</td>
</tr>
<tr>
<td>MySpace</td>
</tr>
<tr>
<td>Second Life</td>
</tr>
<tr>
<td>YouTube</td>
</tr>
<tr>
<td>Blogging</td>
</tr>
<tr>
<td>Forum</td>
</tr>
<tr>
<td>WiKi</td>
</tr>
</tbody>
</table>

3.4 Time of spending on Web 2.0 applications

Figure 1. time spend on Web 2.0
More than two thirds of participants spend 10 or more hours on those applications. This can be considered that most of the participants have reasonable familiarity with Web 2.0 based applications.

3.5 The purposes of using Web 2.0

![Figure 2: Prefer web 2.0 applications (identified by the interviewee)](image)

Instant message such as MSN and QQ were very popular among the respondents, 6 and 5 respectively, 5 people liked to use Google applications in their learning. Forum and Facebook had the same number of people that gave support (4). The results of people who preferred to use YouTube Blog and Skype in their learning was (3, 2, and 2, respectively). All the features in the figure 1.2d above have been identified by the interviews.

<table>
<thead>
<tr>
<th>Web2.0 applications</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skype</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>Google applications</td>
<td>Share documents</td>
</tr>
<tr>
<td>Facebook</td>
<td>Communicate in the community and public, share solutions, ideas, feelings, thinking</td>
</tr>
<tr>
<td>QQ</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>YouTube</td>
<td>Download, uploading and share video files</td>
</tr>
<tr>
<td>MSN</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>Forum</td>
<td>Get feedbacks or comments from other person</td>
</tr>
<tr>
<td>Blog</td>
<td>Get feedbacks or comments from other person</td>
</tr>
</tbody>
</table>
Discussion

This studying reported on current tertiary students' opinions and attitudes towards the educational through the usage of Web 2.0 technique. Those opinions and experiences were captured by means of online questionnaires and described in the previous section. In this section present a summary of the main findings of study:

- Most participants can clearly identify Web 2.0 features such as co-operative learning, virtualized environment, personalized environment and etc. This indicates that most participants have a good understanding about Web 2.0 technology. However, although they are familiar with using Web 2.0 techniques, but they are not certainly advance user. They do not create new web contents. Based on the result of interview, there is no respondents (interview section) mention to use Web 2.0 to produce any Web contents.

- Although most the students are familiar with using Web 2.0 technique like Blog, Forum, FaceBook, YouTube, the entertainments or the ways of keeping in touch with their friends are the main purpose for the students.

- No matter which Web 2.0 applications or technologies are chosen, “ease of use” is the main feature has been identified by most students. It is a common feature for both of the traditional e-learning system and Web 2.0 based application. This may suggest that participants are expecting those good features from traditional e-learning systems to be retained in Web 2.0 based e-learning systems.

- The majority students consider Web 2.0 is able to improve “interaction and cooperation”. These features are able to adopt into e-learning 2.0. Because “learning 2.0 builds the learning environment and optimize learning for focusing on the theme of ‘interaction and cooperation’.” (Bowu, Shengli, Ruan 2010, p. 332).

- The respondents also identified some disadvantages. For instance lack of technical support, lack of authority and lack of face to face communication are three major issues have been pointed out by the students.

- Some advantages that related to specific Web 2.0 applications have been found out by the respondents. For instance SNS (social network service) is good method at create the communication channel, IM (instant message) can largely improve interaction between each group member, Blog is really good tool for “sharing the idea”, “obtain feedback” and “ask and give solutions to problems”. Finally Forum is able to facilitate the communication and collaboration among the team members.
• Blogging, Forum and WiKi are rated positively by 80% to 90% of respondents. This demonstrates participants’ very positive attitudes towards Web 2.0 technologies. It is highly likely to use Web 2.0 techniques into learning, because the majority of student display really high willingness and enthusiasm to use Web 2.0. Besides, the students are familiar with using the common Web 2.0 applications and technologies like Blog, Forum, Facebook, and YouTube.

• Although Web 2.0 techniques blur the boundary between student and teacher, and then change the way of traditional teaching, teacher still needs to play a guide role in the learning process.

• Second Life has been widely acknowledged as a model of participatory Web 2.0 and consider as one of the ideal applications that can be adopted in the academic purpose (Shijuan, 2010; Jianhai and Xiaozhao, 2009; Maged, 2007, et al. and Park, 2008, et al.). But in this research, Second life fail to been mentioned by the respondents.

• Two main issues of using of using Web 2.0 system were identified by the participants. One is that “it was difficult to control information”, which could be due to that all the users, be able to create, edit and update content. This confirms the authoring concern stated at the beginning of this article. Another is that it was “not compatible with common use application”, which may suggests that comparing to the traditional systems, the participants still feel challenge to the new features of Web 2.0 based system.

Conclusion

This study presents the current situation of NZ tertiary students who use Web 2.0 applications and technologies. Being the Web 2.0 applications have become a part of daily life of students, it is essential to know how those applications are able to impact on the users. This research explores that the current Web 2.0 applications do have the value of potential education, but this value still needs to be mined. This study finds although the We 2.0 (Blog, Facebook) are very popular in the students and those students are also very familiar with too, the major problem is that few of them use the Web 2.0 into their learning.

The majority of participants have very positive attitudes towards Web 2.0 based e-learning systems. They display really high willingness and enthusiasm to use Web 2.0. They have a good understanding about Web 2.0 technologies and are familiar with using Web 2.0 techniques. However, they still feel challenge to the new features of Web 2.0, particularly in creating new contents. They expect to retain those good features from traditional e-learning systems in Web 2.0 based e-learning systems.
And besides, Web 2.0 has the neutral characters that may restrict into learning for instance lack of authority. Therefore, the future work need to conduct the research about how to trigger the student to be self-conscious to use Web 2.0 into learning their process and how to limit the disadvantages of Web 2.0 during the learning process.

The current e-learning-based environments focus on the reusability of learning resources. However, these resources are not adaptable to suit learners’ needs, they fail to use explicitly stated instructional strategies, and they lack rich knowledge representations (Zouaq and Nkambou, 2008). With the arrival of Web 3.0, a combination of artificial intelligence and web-based e-learning systems should help to provide learner-oriented adaptive feedbacks, guidelines and instructions.

Publication 2- Designing a Web 2.0 Personal Learning Environment Based on User Requirements

To be submitted to Journal of Applied Computing and Information Technology

Ning Wei
Unitec Institute of Technology, New Zealand
ninghuwei@hotmail.com

Professor Kay Fielden
Unitec Institute of Technology, New Zealand
kfielden@unitec.ac.nz

Abstract

Recent research explores the importance of students participating during the whole learning process. Recent research also finds Web 2.0 technologies are able to improve users’ participation. McLoughlin and Lee (2010, p. 28) state that integrating Web 2.0 technologies into learning means that students “are capable of supporting informal conversation, reflexive dialogue and collaborative content generation, and enabling access to a wide raft of ideas and representations”. As an extension of McLoughlin and Lee’s research, this study explores how Web 2.0 can incorporate the design of personal learning environments (PLE). The main functions of Personal Learning Environments are to help learners to manage their own web courses, update their own learning content, search and share their own learning materials and to conduct co-operative work with another person, therefore improving the value of student learning. In this study requirements for PLEs were gathered from students, and then, an architecture for a personal learning environment based on Web 2.0 was designed. Under this architecture, the learner is able control her/his own learning process. This article is organized into three main sections. First, Web 2.0 concepts and technologies are described. Secondly, the suitability of PLE in the context of Web 2.0 is discussed. Next, requirements gathered from users are described. Finally, a detailed architecture of a Web 2.0 personal learning environment is presented.

Key words

Web 2.0, personal learning environment, E-Learning
Introduction

The adoption of Web 2.0 technologies into the learning and teaching process has become popular during recent years and many universities have sought to utilize these applications and services in their teaching and learning processes. Web 2.0 shifts the traditional learning method from teacher-centered to learner-centered through the improvement of interaction, collaboration and conversation (U & Corder, 2009). Under this new theory, the learner has more opportunities to be involved in the control of the learning and teaching process.

Personal learning environments (PLE) offer a solution for people to apply Web 2.0 technologies for their own learning (Taraghi et al., 2010). A PLE is a private space for learners to manage their own knowledge. This means that a PLE “can be viewed as a self-defined collection of services, tools, and devices that help learners build their Personal Knowledge Networks (PKN), encompassing tacit knowledge nodes (i.e. people) and explicit knowledge nodes (i.e. information)” (Chatti & Jarke, 2011). Casquero et al. (2010), also state that the purpose of PLE is to build a learner-centered environment where the learner is able to embed several tools and services.

A PLE has been constructed based on results gathered from users (online survey and interviews) who have had experience with Web 2.0 applications to meet learning outcomes. The users’ perceptions of Web 2.0 applications for learning were addressed in the three questions below:

1. What are the advantages of Web 2.0 impact on the users’ usage for learning;
2. What are the disadvantages of Web 2.0 impact on the users’ usage for learning; and
3. How can Web 2.0 applications be used in a PLE.

Web 2.0 concept and technologies

Web 2.0 can be defined as a loose collection of upgraded Web 1.0 based technologies and applications that are capable of enhancing the co-operation and sharing among users (O’Reilly, 2005). Through the adoption of Web 2.0 applications into learning, learners are given opportunities to be involved in the control of the learning and teaching process especially in being able to establish their own personal learning environments providing a means of changing from teacher-centered to the learner centered based learning (U & Corder, 2009).

According to Jun and Huiping (2010), the unique concepts of Web 2.0 technologies are that these technologies are people-oriented. This leads to the enhancement of people’s participation. Therefore, Web 2.0 technologies are able to “share many synergies and then fit very well with social constructivist learning pedagogies” (Cochrane & Bateman, 2010, p.3). Vygotsky (1978) suggests that knowledge cannot be transmitted but can be reconstructed by the participation of each individual learner. Bruner (1996) also believes that learning can be considered as a kind of social process,
which happens by sharing information and interactions with each user. In terms of Web 2.0 services, these can be clustered into five main groups.

- Establish contents based on user centered (Blog, Forum, WiKi)
- Social network services (Facebook, YouTube, Second life)
- Emerging forms of publications (Podcasting, RSS)
- Online office suit-package (Google docs)
- Instant Message (Windows live message, QQ).

The following section describes in details for each of those types.

**Type of Web 2.0 technologies**

**User centered content**

User centered content is the main characteristic of Web 2.0, which is that the users are able to write to the web. Typical applications of this type are Blog and Forum that allow users to contribute ideas (Hourigan & Murray, 2010; Duffy, 2009), and upload other format media, for instance image, video or audio files. Consequently, Blog and Forum engage the “learners to hear from other learners, teachers, and experts’ opinions and suggestion on questions” (Jun & Huiping, 2010, p.498).

Wikis functions are very similar to Forum or Blog. Wikis can be considered as a collection of web pages that grant the “write”, “read” or even “restrict” permissions to different users. Therefore, different users may operate such web pages based on permissions granted. According to Wei_Tek et al. (2011), and Guo and Stevens (2011), wikis present positive impacts for collaborative learning.

**Social network services**

Facebook and YouTube are topical, and heavily used examples of a Social network service (SNS). In an SNS, the user is granted the privilege to establish and customize their own space or website that can then be displayed to other users. The structure of this type of web site means that “as a decentralized search engine to look for information or communicate with others is becoming obsolete (Ractham & Firpo, 2011, p. 1)”

Creating a page on Facebook means that individuals can create their own personal environment where other people can be invited to participate and where sharing and communicating with others in this personalized network can take place.

**Emerging forms of publications**

Emerging forms of publications include Podcasts. Podcasting involves the distribution of video or audio file types that can be used to syndicate feed to the internet. RSS (Really simple syndication) is the main method of subscribing for individual feeds. Podcasting consists of two parts, one is “iPod” for Apple (Macintosh) and the other is broadcast. The user can subscribe to video or audio feeds, and then can receive these podcasts automatically. This method represents a very popular way
to use web 2.0. Some lecturers like to record the class process by using iPod, after which files are transferred to mp3 and published on a website for students to download.

**Online office suit-package**
Google docs are a good example of this type. Google docs consisted of three main applications, which are word processing, spreadsheet and presentation. These applications have a similar interface to MS Office therefore making Google Docs easy to use. Conner (2008) suggests that Google Docs allows the user access from different computer and eases the ability to conduct collaborative work through document sharing with others as viewers or editors. “Google Docs supports synchronous editing and comment writing, and saves versions of the document, options that afford real-time collaborative learning” (Blau & Caspi, 2009, p. 49). Similarly to Wiki and Blog, Google docs are able to put comments or modified suggestions into other people’s work without editing the original work (Herrick, 2009).

**Instant message**
Hariharan and Rani (2011) state that instant messaging is an attractive and effective communication method that can be used between people. Liebenberg and Lotriet (2010), in their research, also suggest that instant messaging is a successful tool for personal telecommunication. Commonly used instant message applications are Microsoft MSN messenger (Windows live messengers), yahoo messenger and QQ (China).

In terms of communication method, instant messaging is a synchronous communication method. Instant messaging allows the learner to “be related with a higher level of perceived participation in the e-learning activities, be characterized by slightly denser social networks and spend more time working with content and communication with peers” (Hrastinski, Keller, & Carlsson, 2010, p. 655). Finally, instant messaging is the main communication method that has been used in Mobile learning.

**Suitability of PLE in a Web 2.0 Context**

**What is PLE**
Downes (2005) indicated that a learning environment is a method of learning and is not an application. However, on the internet, a personal learning environment (PLE) can be treated as a personalized individual web space that includes "a collection of tools, brought together under the conceptual notion of openness, interoperability and learner control. As such, PLEs are comprised of two elements – the tools and the conceptual notions that drive how and why we select individual parts (Siemens, 2007). Similarly, Gillet et al. (2010, p. 898) asserted that PLE “are not monolithic systems. They can be simply a set of devices, tools, applications, and physical or virtual spaces associated by learners at a specific time, for a specific purpose, and in a given context.”
Therefore, based on the results of the two studies above, PLE is a personal private web space that is able to integrate several applications or services based on the owner’s requirements and also can be organized and used for pedagogical purposes.

However, even current research has not detailed what personal learning environments are. Schaffert and Hilzensauer (2008) defined the architecture of PLE as:

- The role of the learner
- Personalization
- Content
- Social involvement
- Ownership
- Educational and organizational culture
- Technological aspects.

In the next section, based on these characteristics, is discussed why Web 2.0 technologies are suitable for PLE for personalization, content and social involvement.

**Reasons for Web 2.0 technologies adoption in PLE**

**Improved personalised settings**

Under web 1.0, any webpage is focused on the website itself not the user. For example, in an e-learning web site, for instance, Blackboard, people concentrated on the information on the web page. Therefore, they will give more consideration to what kind of knowledge students have learned and what kinds of learning resource have been uploaded by teachers, but pay little attention to the user centric activities or information. Web 2.0 gives more opportunities for the user, in other words, it is user-centric based. All Web 2.0 applications are built for specific function modules and the users are able to select specific functions and then use these modules to meet their own requirements. For instance, Web 2.0 applications such as Weblog and Wiki empower users to create and manipulate their own content.

In using Web 2.0 technologies, users will be given more chances and privileges to shape and customize their own PLE, which in turn, will help the learner in an active learning manner.

**3.1.2 Micro contents in a PLE**

“Micro content is the prime resource and valuable asset of Web 2.0” (Hu, Cai & Talib, 2010, p. 38) and micro content is a kind of data that is established by users. For instance, this data can be considered as feedback, comments, an article published in the space or a discussion topic conducted in a forum. All of these data types can be treated as micro content. Hu, Cai and Talib (2010), suggest that becoming the consumer or producer of micro content is popular in Europe. More than half of
online users like to make comments in Blogs, release video or video files from their own space or other websites, or become social network contributors.

Micro content of Web 2.0 is also reusable. Anybody is able to use Web2.0 tools such as RSS, Tags or other applications to reorganize, manage, remove or separate those micro-content based on their own requirements. If a PLE consists of several Web 2.0 technologies, the ability to organize a PLE will be enhanced because the learning resources of PLE can be composed, organized and even packaged by the user.

**Social involvement and user participation**
Sociality is a general characteristic of Web 2.0. Web 2.0 focuses on a person-centric approach. That means anybody can generate own content and/or request content from others and then find a way to meet the demands of others. Web 2.0 allows peers to share, collaborate and publish own ideas and experiences with groups of people who share the same interests.

As a result of this, Web 2.0 applications such as Wiki, Weblog, SNS (Social network services) and Forum are based on social interactions and have the potential ability to support and enhance social learning (Shaohua & Peilin, 2010). Therefore, according to Liu et al. (2009), Web 2.0 social interactions not only enhance interactions between each user but also generate rich content. As a result, the value and attraction of such user-generated information increases.

**Web 2.0 PLE user requirements**
This paper uses descriptive statistics to analyze user requirements. A set of reflections on the integration of Web 2.0 applications into PLE are also presented.

**Requirement questions**
Younger generation users may accept Web 2.0 technologies more easily because they are familiar with and use some Web 2.0 applications such as Facebook, YouTube and instant messaging. However, in order to gather Web 2.0 PLE requirements, three questions need to be answered first.

Q1. What the advantages of Web 2.0 impact on the users' usage for learning?
Q2. What the disadvantages of Web 2.0 impact on the users' usage for learning?
Q3. How can Web 2.0 applications be used in a PLE?

To address those questions above, an online survey and interviews were used to gather data from participants.
Results and discussion

Demographics for respondents including gender, age range, majored studied, ethnicity and educational level

From Table 1, it can be seen that most respondents were aged between 21 and 30, and of the 84 respondents, 45 (53.6%) were male and 39 (46.4%) were female. Almost all respondents were international students (92.9%) and 52.4% students were undertaking computing degree the rest of students were undertaking business, or engineering.

<table>
<thead>
<tr>
<th>Age</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>8 (9.5%)</td>
</tr>
<tr>
<td>21-30</td>
<td>51 (60.7%)</td>
</tr>
<tr>
<td>31-40</td>
<td>18 (21.4%)</td>
</tr>
<tr>
<td>More than 40</td>
<td>7 (8.3%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>45 (53.6%)</td>
</tr>
<tr>
<td>Female</td>
<td>39 (46.9%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University</td>
<td>51 (60.7%)</td>
</tr>
<tr>
<td>Polytechnic</td>
<td>25 (29.8%)</td>
</tr>
<tr>
<td>Others</td>
<td>8 (9.5%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Majoring studied</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td>22 (26.2%)</td>
</tr>
<tr>
<td>Computing</td>
<td>44 (52.4%)</td>
</tr>
<tr>
<td>Engineering</td>
<td>7 (8.3%)</td>
</tr>
<tr>
<td>Others</td>
<td>11 (12.9%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>English as second language</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>78 (92.9%)</td>
</tr>
<tr>
<td>No</td>
<td>6 (7.1%)</td>
</tr>
</tbody>
</table>

Table 1 Demographic Information (n=84)

Table 2 rates IT general experiences of respondents from 1 (no experience) to 7 (highly experienced) and it can be seen that most participants had good skills in using email, web browser and MS Office (average ranking scores around 6 out of 7), but skills in coding Web pages were rated much lower (average ranking scores was 3.31).
<table>
<thead>
<tr>
<th>Items</th>
<th>Average score*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using Web browsers</td>
<td>6.05</td>
</tr>
<tr>
<td>Using e-mail</td>
<td>6.20</td>
</tr>
<tr>
<td>Using MS Office packages</td>
<td>5.37</td>
</tr>
<tr>
<td>Coding Web pages</td>
<td>3.31</td>
</tr>
</tbody>
</table>

*Average score = number of respondents in this rating score * related rating score/84

Table 3 General IT Skills (n=84)

Table 4 shows that most Web 2.0 applications have been considered as providing co-operative learning, are easy to use and are able to have personal learning environments built. Respondents gave more emphasis to “ease of use”, which was also an expected outcome, because no matter how good the applications are, “ease of use” was be granted the first priority.
learning (number in the table is the respondent count of that criterion)

Facebook, Blogging and MSN are the three top Web 2.0 technologies that have been identified by the respondents (with counts of 40, 43 and 30 respectively). These respondents believed that the functionalities of Facebook, Blogging and MSN were a good example for a PLE. Therefore, based on this result, it would be advantageous if PLEs have the functionalities of Facebook, Blogging and MSN.

Finally, to conduct co-operative learning is another characteristic that is been identified by these respondents. The three top Web 2.0 applications are Forum, Wiki and Blog (47, 40 and 37 respectively). Therefore, based on this result, it would be advantageous for a PLE to have the function of co-operative working like Forum, Wiki and Blog.

Table 5 shows disadvantages of some common Web 2.0 applications that have an impact on the users' usage for learning.

From this sample, most respondents believe that a lack of information control, technical support and academic function are major issues of Web 2.0 technologies like Facebook, YouTube, Google apps, MSN, Blogging, Forum and Wiki.

<table>
<thead>
<tr>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with common use application such as MS Office</th>
<th>Not enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>14</td>
<td>34</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>Google apps</td>
<td>11</td>
<td>21</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>MSN</td>
<td>15</td>
<td>25</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Myspace</td>
<td>43</td>
<td>12</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td>Second life</td>
<td>58</td>
<td>10</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>YouTube</td>
<td>16</td>
<td>25</td>
<td>23</td>
<td>26</td>
</tr>
<tr>
<td>Blogging</td>
<td>15</td>
<td>33</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Forum</td>
<td>10</td>
<td>32</td>
<td>34</td>
<td>26</td>
</tr>
<tr>
<td>Wiki</td>
<td>14</td>
<td>30</td>
<td>34</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 5 Disadvantages of Web 2.0 impact on the users' usage towards to the learning (number in the table is the respondent count of that criterion)

Information control could become a problem when people use Web 2.0 technologies to create a PLE. Users familiar with Web 2.0, feel they have the right to contribute to a PLE, and that a PLE needs to be able to control information. These participants also felt that a PLE needs to have a filter to control trash as well.

In Table 6 it can be seen that participants tended to believe that communication services (synchronous or asynchronous) was the most important role in an E-Learning system. Almost all participants paid more attention to communication in order to
obtain feedback or comments from others. This result indicates that a PLE needs to integrate Web 2.0 technologies such as MSN, Forum and Blog.

<table>
<thead>
<tr>
<th>Name of web 2.0 applications</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skype</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>Google applications</td>
<td>Share documents</td>
</tr>
<tr>
<td>Facebook</td>
<td>Communicate in the community and public, share solutions, ideas, feelings, thinking</td>
</tr>
<tr>
<td>QQ</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>YouTube</td>
<td>Download, upload and share video files</td>
</tr>
<tr>
<td>MSN</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>Forum</td>
<td>Get feedback or comments from another person</td>
</tr>
<tr>
<td>Blog</td>
<td>Get feedback or comments from another person</td>
</tr>
</tbody>
</table>

Table 6 Summary of common uses of Web 2.0 applications for learning

**Web 2.0 PLE user requirements**

Based on the results from the online survey and interviews, Web 2.0 PLE requirements are summarized below:

- ease of use
- offer both synchronous and asynchronous communication methods
- allow the user to create web content and conduct co-operative work
- allow the user to have full privilege to manage their own PLE (including upload, download, remove, share and search learning resources)
- provide the functions to control the information on a PLE (personal learning)
- provide enough technical support.

**Conceptual Web 2.0 PLE structure**

In this paper, a conceptual Web 2.0 PLE based on user requirements gathered in the previous stage is discussed. Zubrinic and Kalpic (2008) state that a Web 2.0 PLE is a Web application that allows the users to control their own learning processes through distributed resources.

Oliveira and Moreira (2008) presented a methodology about how to use Web 2.0 applications in learning (p. 1174). This structure provides the initial theoretical support for integration of Web 2.0 technologies into learning processes.
According Downes (2005), no matter what kind of technology is used, a PLE should have three basic principles 1) Interaction; 2) Usability; and 3) Relevance. Interaction means “the ability to communicate with other persons interested in the same topic, or using the same resources available on the Web” (Žubrinić & Kalpić, 2008, p. 55). This opinion is consistent with the user’s requirements in the previous stage (communication).

Functionality of the Web 2.0 PLE that has been constructed is based on the model proposed above. This PLE shown in Figure 2 makes possible the ability:

1) to conduct both synchronous and asynchronous communication;
2) for owners to have full privilege of own PLE (user-centered);
3) to conduct search, have cooperation and be able to exchange information with other users; and
4) to create web content based on knowledge in the domain for learning.

Under this model, learning represents the combination of watching, thinking and trying (Kolb & Fry, 1975).
Conclusion

From Web 2.0 technologies emerge a new way for users to personalize their own online existence. “User centered, participation, social networking services empowers learners to create informal associations or communities of practice, in which to develop their own subject-based mastery (Hall, 2009, p. 38).” Through the integration of web 2.0 technologies (tools) into a PLE, students are granted autonomy to develop their own learning processes.

The conceptual structure of Web 2.0 PLE presented in this studying encompasses and integrates a diverse range of personalized aggregations of applications, and its contents are contributed from a range of different places. This aggregation and content certainly can be reused or restructured in different places, depending on the different personal tasks to be carried out, or the specific requirements to be meet.

In conclusion, Web 2.0 PLE is capable of providing learners with a flexible, diversified and self-control environment in which they can conduct their own learning processes. However, because of Web 2.0 architecture, some problems may occur, for instance lack of authority and information control. Future research will be
conducted with the conceptual web 2.0 PLE model to which control functions will be added.

References


KunMing, YunNan, P. R. China.
Publication 3-Web 2.0 Personal Learning Environment design

Based on User Requirements

To be submitted to 2011 AIS-SIGED (2011 Association of Information Systems – Special Interest Group on Education)

Ning Wei
Unitec Institute of Technology, New Zealand
ninghuwei@hotmail.com

Professor Kay Fielden
Unitec Institute of Technology, New Zealand
kfielden@unitec.ac.nz

ABSTRACT:

Personal Learning Environments (PLE)s help learners to manage own web courses, update own learning content, search and share own learning materials and to conduct co-operative learning, therefore improving the value of student learning. In this study, PLE requirements were gathered from tertiary students, and then a personal learning environment architecture based on Web 2.0 was designed. Under this architecture, the learner is able to control her/his own learning process. This article is organized into three main sections. First, Web 2.0 concepts and technologies are described. Secondly, the suitability of PLE in the context of Web 2.0 is discussed. Next, requirements gathered from users are described, and finally, a detailed architecture of a Web 2.0 personal learning environment is presented.

Keywords: Web 2.0, Personal learning environment, E-Learning

I. INTRODUCTION

The adoption of Web 2.0 technologies into the learning and teaching process has become popular during recent years and many universities have sought to utilize these applications and services in their teaching and learning processes. Web 2.0 shifts the traditional learning method from teacher-centered to learner-centered through the improvement of interaction, collaboration and conversation (U and Corder, 2009). Under this new theory, the learner has more opportunities to be involved in the control of the learning and teaching process.

Personal learning environments (PLE) offer a solution for people to apply Web 2.0 technologies for their own learning (Taraghi et. al, 2010). A PLE is a private space for learners to manage their own knowledge. This means that a PLE “can be viewed as a self-defined collection of services, tools, and devices that help learners build their Personal Knowledge Networks (PKN), encompassing tacit knowledge nodes (i.e. people) and explicit knowledge nodes (i.e. information)” (Chatti & Jarke, 2011).
Casquero et al. (2010), also state that the purpose of PLE is to build a learner-centered environment where the learner is able to embed several tools and services.

A PLE has been constructed based on results gathered from users (online survey and interviews) who have had experience with Web 2.0 applications to meet learning outcomes. The users’ perceptions of Web 2.0 applications for learning were addressed in the three questions below:
4. What are the advantages of Web 2.0 impact on the users’ usage for learning;
5. What are the disadvantages of Web 2.0 impact on the users’ usage for learning; and
6. How can Web 2.0 applications be used in a PLE.

II. Web 2.0 concept and technologies

Web 2.0 can be defined as a loose collection of upgraded Web 1.0 based technologies and applications that are capable of enhancing the co-operation and sharing among users (O’Reilly, 2005). Through the adoption of Web 2.0 applications into learning, learners are given opportunities to be involved in the control of the learning and teaching process especially in being able to establish their own personal learning environments providing a means of changing from teacher-centered to the learner centered based learning (U & Corder, 2009).

According to Jun and Huiping (2010), the unique concepts of Web 2.0 technologies are that these technologies are people-oriented. This leads to the enhancement of people’s participation. Therefore, Web 2.0 technologies are able to “share many synergies and then fit very well with social constructivist learning pedagogies” (Cochrane & Bateman, 2010, p.3). Vygotsky (1978) suggests that knowledge cannot be transmitted but can be reconstructed by the participation of each individual learner. Bruner (1996) also believes that learning can be considered as a kind of social process, which happens by sharing information and interactions with each user.

In terms of Web 2.0 services, these can be clustered into five main groups.

- Establish contents based on user centered (Blog, Forum, WiKi)
- Social network services (Facebook, YouTube, Second life)
- Emerging forms of publications (Podcasting, RSS)
- Online office suit-package (Google docs)
- Instant Message (Windows live message, QQ).

The following section describes in details for each of those types.

**TYPES OF WEB 2.0 TECHNOLOGIES**

**User centered content**

User centered content is the main characteristic of Web 2.0, which is that the users are able to write to the web. Typical applications of this type are Blog and Forum that allow users to contribute ideas
(Hourigan & Murray, 2010; Duffy, 2009), and upload other format media, for instance image, video or audio files. Consequently, Blog and Forum engage the “learners to hear from other learners, teachers, and experts’ opinions and suggestion on questions (Jun & Huiping, 2010, p.498)”.

Wikis functions are very similar to Forum or Blog. Wikis can be considered as a collection of web pages that grant the “write”, “read” or even “restrict” permissions to different users. Therefore, different users may operate such web pages based on permissions granted. According to Wei_Tek et al. (2011), and Guo and Stevens (2011), Wikis present positive impacts for collaborative learning.

SOCIAL NETWORK SERVICES
Facebook and YouTube are topical, and heavily used examples of a Social network service (SNS). In an SNS, the user is granted the privilege to establish and customize their own space or website that can then be displayed to other users. The structure of this type of web site means that “as a decentralized search engine to look for information or communicate with others is becoming obsolete (Ractham & Firpo, 2011, p. 1)”. Creating a page on Facebook means that individuals can create their own personal environment where other people can be invited to participate and where sharing and communicating with others in this personalized network can take place.

Emerging Forms of Publications
Emerging forms of publications include Podcasts. Podcasting involves the distribution of video or audio file types that can be used to syndicate feed to the internet. RSS (Really simple syndication) is the main method of subscribing for individual feeds. Podcasting consists of two parts, one is “iPod” for Apple (Macintosh) and the other is broadcast. The user can subscribe to video or audio feeds, and then can receive these podcasts automatically. This method represents a very popular way to use web 2.0. Some lecturers like to record the class process by using iPod, after which files are transferred to mp3 and published on a website for students to download.

Online office suit-package
Google docs are a good example of this type. Google docs consisted of three main applications, which are word processing, spreadsheet and PowerPoint. These applications have a similar interface to MS Office therefore making Google Docs easy to use. Conner (2008) suggests that Google Docs allows the user access from different computer and eases the ability to conduct collaborative work through document sharing with others as viewers or editors. “Google Docs support synchronous editing and comment writing, and save versions of the document, options that afford real-time collaborative learning” (Blau & Caspi, 2009, p. 49). Similarly to Wiki and Blog, Google docs are able to put comments or modified suggestions into other people’s work without editing the original work (Herrick, 2009).

Instant message
Hariharan and Rani (2011) state that instant messaging is an attractive and effective communication method that can be used between people. Liebenberg and Lotriet (2010), in their research, also suggest that instant messaging is a successful tool for personal telecommunication. Commonly used instant message applications are Microsoft MSN messenger (Windows live messengers), yahoo
messenger and QQ (China).

In terms of communication method, instant messaging is a synchronous communication method. Instant messaging allows the learner to “be related with a higher level of perceived participation in the e-learning activities, be characterized by slightly denser social networks and spend more time working with content and communication with peers” (Hrastinski, Keller, & Carlsson, 2010, p. 655). Finally, instant messaging is the main communication method that has been used in Mobile learning.

III. SUITABILITY OF PLE IN A WEB 2.0 CONTEXT

What is a PLE

In 2005, Downes indicated that a learning environment is a method of learning and is not an application. However, on the internet, a personal learning environment (PLE) can be treated as a personalized individual web space that includes “a collection of tools, brought together under the conceptual notion of openness, interoperability and learner control. As such, PLEs are comprised of two elements – the tools and the conceptual notions that drive how and why we select individual parts (Siemens, 2007). Similarly, Gillet et al. (2010, p. 898) asserted that PLE “are not monolithic systems. They can be simply a set of devices, tools, applications, and physical or virtual spaces associated by learners at a specific time, for a specific purpose, and in a given context.” Therefore, based on the results of the two studies above, PLE is a personal private web space that is able to integrate several applications or services based on the owner’s requirements and also can be organized and used for pedagogical purposes.

However, even current research has not detailed what personal learning environments are. Schaffert and Hilzensauer (2008) defined the architecture of PLE as:

- The role of the learner
- Personalization
- Content
- Social involvement
- Ownership
- Educational and organizational culture
- Technological aspects.

In the next section, based on these characteristics, is discussed why Web 2.0 technologies are suitable for PLE for personalization, content and social involvement.
REASONS FOR WEB 2.0 TECHNOLOGIES ADOPTION IN PLE

Improved personalised settings
Under web 1.0, any webpage is focused on the website itself not the user. For example, in an e-learning web site, for instance, Blackboard, people concentrated on the information on the web page. Therefore, they will give more consideration to what kind of knowledge students have learned and what kinds of learning resource have been uploaded by teachers, but pay little attention to the user centric activities or information. Web 2.0 gives more opportunities for the user, in other words, it is user-centric based. All Web 2.0 applications are built for specific function modules and the users are able to select specific functions and then use these modules to meet their own requirements. For instance, Web 2.0 applications such as Weblog and WiKi empower users to create and manipulate their own content.

In using Web 2.0 technologies, users will be given more chances and privileges to shape and customize their own PLE, which in turn, will help the learner in an active learning manner.

Micro contents in a PLE
“Micro content is the prime resource and valuable asset of Web 2.0” (Hu, Cai and Talib, 2010, p. 38) and micro content is a kind of data that is established by users. For instance, this data can be considered as feedback, comments, an article published in the space or a discussion topic conducted in a forum. All of these data types can be treated as micro content. Hu, Cai and Talib (2010), suggest that becoming the consumer or producer of micro content is popular in Europe. More than half of online users like to make comments in Blogs, release video or video files from their own space or other web sites, or become social network contributors.

Micro content of Web 2.0 is also reusable. Anybody is able to use Web2.0 tools such as RSS, Tags or other applications to reorganize, manage, remove or separate those micro-content based on their own requirements. If a PLE consists of several Web 2.0 technologies, the ability to organize a PLE will be enhanced because the learning resources of PLE can be composed, organized and even packaged by the user.

Social involvement and user participation
Sociality is a general characteristic of Web 2.0. Web 2.0 focuses on a person-centric approach. That means anybody can generate own content and/or request content from others and then find a way to meet the demands of others. Web 2.0 allows peers to share, collaborate and publish own ideas and experiences with groups of people who share the same interests.

As a result of this, Web 2.0 applications such as WiKi, Weblog, SNS (Social network services) and Forum are based on social interactions and have the potential ability to support and enhance social learning (Shaohua & Peilin, 2010). Therefore, according to Liu et al. (2009), Web 2.0 social interactions not only enhance interactions between each user but also generate rich content. As a result, the value and attraction of such user-generated information increases.
IV. WEB 2.0 PLE USER REQUIREMENTS
This paper uses descriptive statistics to analyze user requirements. A set of reflections on the integration of Web 2.0 applications into PLE are also presented.

REQUIREMENT QUESTIONS

Younger generation users may accept Web 2.0 technologies more easily because they are familiar with and use some Web 2.0 applications such as Facebook, YouTube and instant messaging. However, in order to gather Web 2.0 PLE requirements, three questions need to be answered first.

Q1. What the advantages of Web 2.0 impact on the users' usage for learning
Q2. What the disadvantages of Web 2.0 impact on the users' usage for learning
Q3. How can Web 2.0 applications be used in a PLE.

To address those questions above, an online survey and interviews were used to gather data from participants.

V. Results and discussion

DEMOGRAPHICS FOR RESPONDENTS INCLUDING GENDER, AGE RANGE, MAJORED STUDIED, ETHNICITY AND EDUCATIONAL LEVEL

From Table 1, it can be seen that most respondents were aged between 21 and 30, and of the 84 respondents, 45 (53.6%) were male and 39 (46.4%) were female. Almost all respondents were international students (92.9%) and 52.4% students were undertaking computing degree the rest of students were undertaking business, or engineering.

<table>
<thead>
<tr>
<th>Age</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-20</td>
<td>8 (9.5%)</td>
</tr>
<tr>
<td>21-30</td>
<td>51 (60.7%)</td>
</tr>
<tr>
<td>31-40</td>
<td>18 (21.4%)</td>
</tr>
<tr>
<td>More than 40</td>
<td>7 (8.3%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>45 (53.6%)</td>
</tr>
<tr>
<td>Female</td>
<td>39 (46.4%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Education</th>
<th>Count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University</td>
<td>51 (60.7%)</td>
</tr>
</tbody>
</table>
Table 2 rates IT general experiences of respondents from 1 (no experience) to 7 (highly experienced) and it can be seen that most participants had good skills in using email, web browser and MS Office (average ranking scores around 6 out of 7), but skills in coding Web pages were rated much lower (average ranking scores was 3.31).

Table 3 provides descriptive statistics about the advantages of some common Web 2.0 applications and the impact on what features are used for learning.

Table 4 shows that most Web 2.0 applications have been considered as providing co-operative
learning, are easy to use and are able to have personal learning environments built. Respondents gave more emphasis to “ease of use”, which was also an expected outcome, because no matter how good the applications are, “ease of use” was be granted the first priority.

Table 4: Advantages of Web 2.0 impact on the users’ usage towards to the learning (number in the table is the respondent count of that criterion)

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Ease of Use</th>
<th>Cooperative learning</th>
<th>Concurrency control</th>
<th>Virtualized environment</th>
<th>Personalised environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>13 (15.48%)</td>
<td>39 (46.43%)</td>
<td>35 (41.67%)</td>
<td>8 (9.52%)</td>
<td>21 (25%)</td>
<td>40 (47.62%)</td>
</tr>
<tr>
<td>Google apps</td>
<td>11 (13.09%)</td>
<td>44 (52.38%)</td>
<td>36 (42.86%)</td>
<td>32 (38.10%)</td>
<td>15 (17.86%)</td>
<td>29 (34.52%)</td>
</tr>
<tr>
<td>MSN</td>
<td>16 (19.05%)</td>
<td>35 (41.67%)</td>
<td>29 (34.52%)</td>
<td>10 (11.90%)</td>
<td>10 (11.90%)</td>
<td>35 (41.67%)</td>
</tr>
<tr>
<td>Myspace</td>
<td>41 (48.81%)</td>
<td>20 (23.81%)</td>
<td>16 (19.05%)</td>
<td>6 (7.14%)</td>
<td>8 (9.52%)</td>
<td>23 (27.38%)</td>
</tr>
<tr>
<td>Second Life</td>
<td>51 (60.71%)</td>
<td>12 (14.29%)</td>
<td>11 (13.09%)</td>
<td>2 (2.38%)</td>
<td>12 (14.29%)</td>
<td>9 (10.71%)</td>
</tr>
<tr>
<td>YouTube</td>
<td>11 (13.09%)</td>
<td>46 (54.76%)</td>
<td>26 (30.95%)</td>
<td>8 (9.52%)</td>
<td>33 (39.29%)</td>
<td>20 (23.81%)</td>
</tr>
<tr>
<td>Blogging</td>
<td>13 (15.48%)</td>
<td>42 (50%)</td>
<td>37 (44.05%)</td>
<td>9 (10.71%)</td>
<td>10 (11.90%)</td>
<td>43 (51.19%)</td>
</tr>
<tr>
<td>Forum</td>
<td>7 (8.33%)</td>
<td>44 (52.38%)</td>
<td>47 (55.95%)</td>
<td>13 (15.48%)</td>
<td>17 (20.24%)</td>
<td>27 (32.14%)</td>
</tr>
<tr>
<td>Wiki</td>
<td>7 (8.33%)</td>
<td>51 (60.71%)</td>
<td>40 (47.62%)</td>
<td>15 (17.86%)</td>
<td>17 (20.24%)</td>
<td>30 (35.71%)</td>
</tr>
</tbody>
</table>

Facebook, Blogging and MSN are the three top Web 2.0 technologies that have been identified by the respondents (47.62%, 51.19% and 35.71% respectively). These respondents believed that the functionalities of Facebook, Blogging and MSN were a good example for a PLE. Therefore, based on this result, it would be advantageous if PLEs have the functionalities of Facebook, Blogging and MSN.

Finally, to conduct co-operative learning is another characteristic that is been identified by these respondents. The three top Web 2.0 applications are Forum, Wiki and Blog (55.95%, 47.62% and 44.05% respectively). Therefore, based on this result, it would be advantageous for a PLE to have the function of co-operative working like Forum, Wiki and Blog.

Table 5: Disadvantages of Web 2.0 impact on the users’ usage towards to the learning (number in the table is the respondent count of that criterion)

<table>
<thead>
<tr>
<th></th>
<th>Not used</th>
<th>Difficult to control information</th>
<th>Lack of technical support</th>
<th>Not compatible with common use apps such as MSOffice</th>
<th>Not enough functions for academic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>14 (16.67%)</td>
<td>34 (40.48%)</td>
<td>28 (33.33%)</td>
<td>26 (30.95%)</td>
<td>34 (40.48%)</td>
</tr>
<tr>
<td>Google apps</td>
<td>11 (13.09%)</td>
<td>21 (25%)</td>
<td>28 (33.33%)</td>
<td>32 (38.10%)</td>
<td>24 (28.57%)</td>
</tr>
<tr>
<td>MSN</td>
<td>15 (17.86%)</td>
<td>25 (29.76%)</td>
<td>30 (35.71%)</td>
<td>20 (23.81%)</td>
<td>38 (45.24%)</td>
</tr>
<tr>
<td>Myspace</td>
<td>43 (51.19%)</td>
<td>12 (14.29%)</td>
<td>19 (22.62%)</td>
<td>18 (21.43%)</td>
<td>22 (26.19%)</td>
</tr>
<tr>
<td>Second Life</td>
<td>58 (69.05%)</td>
<td>10 (11.90%)</td>
<td>11 (13.09%)</td>
<td>11 (13.09%)</td>
<td>12 (14.29%)</td>
</tr>
<tr>
<td>YouTube</td>
<td>16 (19.05%)</td>
<td>25 (29.76%)</td>
<td>26 (30.95%)</td>
<td>26 (30.95%)</td>
<td>25 (29.76%)</td>
</tr>
<tr>
<td>Blogging</td>
<td>15 (17.86%)</td>
<td>33 (39.29%)</td>
<td>29 (34.52%)</td>
<td>27 (32.14%)</td>
<td>32 (38.10%)</td>
</tr>
<tr>
<td>Forum</td>
<td>10 (11.90%)</td>
<td>32 (38.10%)</td>
<td>34 (40.48%)</td>
<td>26 (30.95%)</td>
<td>22 (26.19%)</td>
</tr>
<tr>
<td>Wiki</td>
<td>14 (16.67%)</td>
<td>30 (35.71%)</td>
<td>34 (40.48%)</td>
<td>20 (23.81%)</td>
<td>26 26 (30.95%)</td>
</tr>
</tbody>
</table>
Table 5 shows disadvantages of some common Web 2.0 applications that have an impact on the users' usage for learning.

From this sample, most respondents believe that a lack of information control, technical support and academic function are major issues of Web 2.0 technologies like Facebook, YouTube, Google apps, MSN, Blogging, Forum and Wiki.

Information control could become a problem when people use Web 2.0 technologies to create a PLE. Users familiar with Web 2.0, feel they have the right to contribute to a PLE, and that a PLE needs to be able to control information. These participants also felt that a PLE needs to have a filter to control trash as well.

In Table 6 it can be seen that participants tended to believe that communication services (synchronous or asynchronous) was the most important role in an E-Learning system. Almost all participants paid more attention to communication in order to obtain feedback or comments from others. This result indicates that a PLE needs to integrate Web 2.0 technologies such as MSN, Forum and Blog.

<table>
<thead>
<tr>
<th>Name of web 2.0 applications</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skype</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>Google applications</td>
<td>Share documents</td>
</tr>
<tr>
<td>Facebook</td>
<td>Communicate in the community and public, share solutions, ideas, feelings, thinking</td>
</tr>
<tr>
<td>YouTube</td>
<td>Download, upload and share video files</td>
</tr>
<tr>
<td>MSN</td>
<td>Communicate with another person</td>
</tr>
<tr>
<td>Forum</td>
<td>Get feedback or comments from another person</td>
</tr>
<tr>
<td>Blog</td>
<td>Get feedback or comments from another person</td>
</tr>
</tbody>
</table>

WEB 2.0 PLE USER REQUIREMENTS

Based on the results from the online survey and interviews, Web 2.0 PLE requirements are summarized below:

- ease of use
- offer both synchronous and asynchronous communication methods
- allow the user to create web content and conduct co-operative work
- allow the user to have full privilege to manage their own PLE (including upload, download, remove, share and search learning resources)
- provide the functions to control the information on a PLE (personal learning)
- provide enough technical support.
CONCEPTUAL WEB 2.0 PLE STRUCTURE
In this chapter a conceptual Web 2.0 PLE based on the user requirements gathered in previous stage is discussed. Žubrinić and Kalpić (2008), state that a Web 2.0 PLE is a Web application that allows the users to control their own learning processes through distributed resources.

Oliveira and Moreira (2008) presented a methodology about how to use Web 2.0 applications in learning (p. 1174). This structure provides the initial theoretical support for integration of Web 2.0 technologies into learning processes.

Figure 1 Methodology used in the study on the use of Web 2.0 applications
According Downes (2005), no matter what kind of technology is used, a PLE should have three basic principles: 1) Interaction; 2) Usability; and 3) Relevance.

Interaction means “the ability to communicate with other persons interested in the same topic, or using the same resources available on the Web” (Žubrinić & Kalpić, 2008, p. 55). This opinion is consistent with the user’s requirements in the previous stage (communication).

Functionality of the Web 2.0 PLE that has been constructed is based on the model proposed above. This PLE shown in Figure 2 makes possible the ability:

5) to conduct both synchronous and asynchronous communication;
6) for owners to have full privilege of own PLE (user-centered);
7) to conduct search, have cooperation and be able to exchange information with other users; and
8) to create web content based on knowledge in the domain for learning.

Under this model, learning represents the combination of watching, thinking and trying (Kolb and Fry, 1975).
vi. Conclusion

From Web 2.0 technologies emerge a new way for users to personalize their own online existence. “User centered, participation, social networking services empowers learners to create informal associations or communities of practice, in which to develop their own subject-based mastery (Hall, 2009, p. 38).” Through the integration of web 2.0 technologies (tools) into a PLE, students are granted autonomy to develop their own learning processes.

The conceptual structure of Web 2.0 PLE presented in this studying encompasses and integrates a diverse range of personalized aggregations of applications, and its contents are contributed from a range of different places. This aggregation and content certainly can be reused or restructured in different places, depending on the different personal tasks to be carried out, or the specific requirements to be meet.

In conclusion, Web 2.0 PLE is capable of providing learners with a flexible, diversified and self-control environment in which they can conduct their own learning processes. However, because of Web 2.0 architecture, some problems may occur, for instance lack of authority and information control. Future research will be conducted with the conceptual web 2.0 PLE model to which control functions
will be added.

References


Herrick, D. R. (2009). Google this! Using Google apps for collaboration and productivity. SIGUCCS ’09 Proceedings of the 37th annual ACM SIGUCCS fall Conference (pp. 55 -63), New York, U.S.A.


