

DESIGN OF INTERNET-RELATED COURSES FOR IT PROFESSIONALS

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Abstract : With the emergence of E-commerce, the Internet-related activities have been escalated for the past two years in Hong Kong. As a result of this, there is an increasing demand on the IT professionals who are able to design, develop, and support the Web businesses. However, there are a few professional courses available in these areas to re-train the existing IT professionals. Although, e-commerce or related programmes are being offered by universities in Hong Kong, it needs to take a couple of years before the graduates are released to the market. There is an immediate need to design and offer related courses to meet the community need. This paper presents course design philosophy on the Internet-related certificate courses that are being offered jointly by the Division of Computer Studies and the School of Professional and Continuing Education, City University of Hong Kong. The paper covers the practicality on the course contents in order to meet the diversified skill sets. It addresses the balance between technical substances and commercial skills. These include the knowledge, skills and proficiency on e-commerce, programming, database design, IT security, legal issues, technical support, e-entertainment, web design involving multi-media technology etc. The strengths and weakness of these courses, students' behaviours, and the future direction are also discussed in this paper.

1 INTRODUCTION

The emerging e-business in recent years has opened up many opportunities for new development and training in IT applications. This emergence will translate into a new demand for the design of user-friendly, content based and sophisticated software over the Internet. On the other hand, the convergence of computing and communication technologies is beginning to impact on organizational processes in terms of product development, resource acquisition, order fulfillment, customer service and ways of doing business. Apart from the business to business and customer to business models, the product promotion, e-entertainment, security, multi-media based interface, and information search over the Internet are of significance to a successful business.

With the move to a knowledge-based society, there is a strong demand for IT professionals and business analysts to make use of the Internet platform for business activities. There is a strong demand of professional courses to train IT professionals to design, support and administer the web sites; business analysts to make use of the web site to promote products and to do business; security professionals to develop a more secure transaction platform making use of firewall; legal practitioners to enforce cyber law to protect both parties; and for Web designer to create a nice interface with creativity. In view of these requirements, this paper addresses the design issues related to the Internet based vocational courses. The objectives of this paper are to:

- examine how successful the courses have been in attracting and retaining learners and assess the methods used in the process;

- assess the success of flexible design methodologies in terms of the method of delivery and relevance of the training contents; and
- compare and contrast the performance of the various courses and identify factors influencing their performance.

The paper is organized as follows. Section 2 presents a brief description on course design related to the Internet. Sections 3 and 4 present the admission requirements and course structure. The learning environment, motive for attending and barriers are also discussed. Section 5 lists the operational consideration and objectives achievement. The course assurance and monitoring are covered in section 6. The advantages and limitations are discussed in section 7.

2 COURSE DESIGN

Shown in Figure 1 is the block diagram describing the Internet activities. In this diagram, a browser can access the information stored in a server or through its database server. The user might want to download software or to visualize the virtual reality effect. This involves the multi-media technology. A user might want to buy a product, he needs to input his Visa card number. This involves the customer to business model and security. A company buyer might place an order to buy products. This involves the business to business model. A business analyst might look at the opportunity of using web to promote products in order to have global presence and market penetration. A customer engineer might need to support the hardware, router, server etc. to ensure the system is running smoothly. A database administrator might support the web database to ensure the relevance of contents requested by the user.

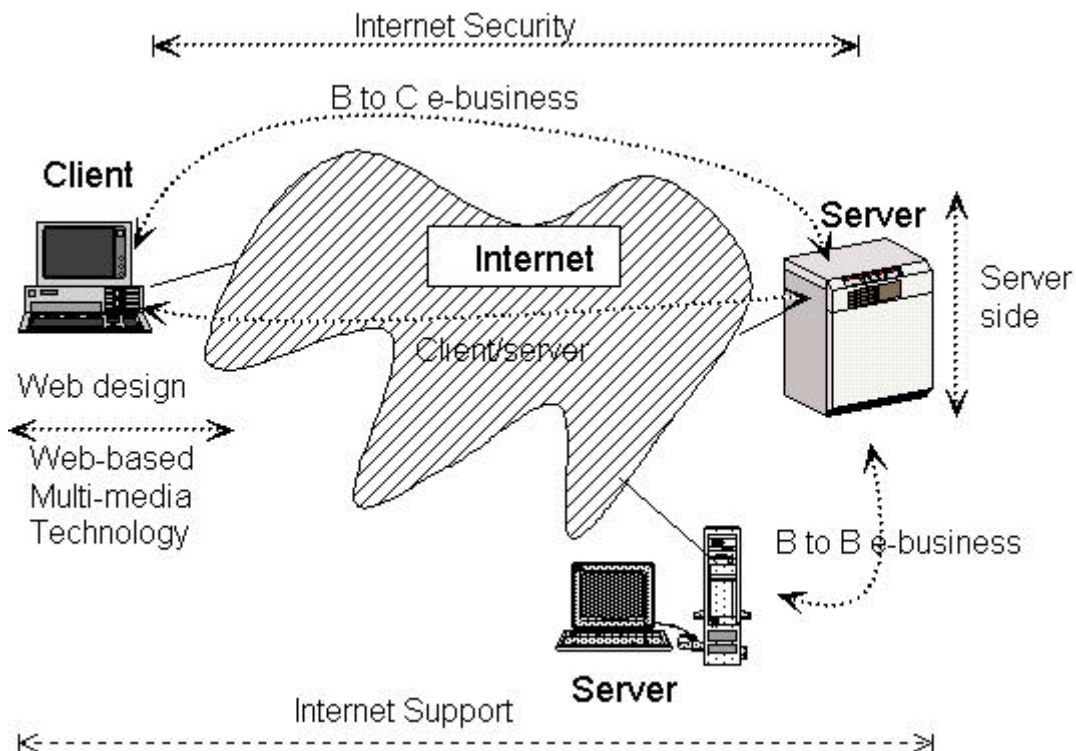


Figure 1 Training demands over the Internet

In order to meet the need, there are a number of potential courses that are specifically designed on the understanding the Internet as shown in Table 1.

Table 1 Course aims and training platform

Course	Aims	Training platform
Developing e-business	How to make use of the Internet to sell/buy products	Understanding the necessary technical skills, e-marketing, payment, security, legal aspects
Web Programming	How to develop client and server side to process data	Java, Database, JavaScript, HTML and Extended HTML
Web based Multi-media technology	To develop a sophisticated interface with graphics, animation etc.	Flash, director, virtual reality markup language, computer music, video/audio editing
Web design	To provide a good user interface and screen layout	Design foundation, sketch concept, 2D/3D visualization
Internet Security	To provide a secure trading platform and set up policy	Cryptograph, secure socket layer, virus free environment, firewall
Server side using Linux	To provide in-depth knowledge on the installation, commission, support of server using Linux	PHP, CGI, IP networking, X Windows, Linux
Internet Support	To provide support on Internet/Extranet	IP network, router, switch, LAN and WAN
Digital entertainment	To use Internet to provide game	Direct X, Script writing, Computer graphics, animation

The majority of courses are being offered. Some are even offered for longer two years. To describe the details of aims and objectives, two courses such as Web design and Server side using Linux are specifically shown below for reference.

2.1 Aims and objectives on Web Design

This course is designed to equip IT practitioners who has little knowledge on design but are involved in dealing with the use of multi-media products to develop Web applications. The working environment is the Internet based client-server system. This course aims to provide fundamental design concept, knowledge and skills to those who may wish to keep up with developments either for career advancement or the acceptance of new responsibilities. The course covers the materials to participants in developing more innovative but practical Web interfaces with the following knowledge and skills:

- Posses a sound broad-based foundation on visualisation;
- Posses the fundamental skills in 2D and 3D studies;
- Be capable to produce a 2D/3D layout/sketch using computer package; and

- Acquire an understanding in quick sketch, figure drawing, design principle, typography, colour principle, form and texture, and be capable to apply the techniques on the Web page.

2.2 Aims and objectives of Server Side using Linux

This course is about the server side, as Linux has become the powerful industrial standard operating system on computers ranging from PC to supercomputer. Linux is a UNIX like operating system, its kernel is supported in part by utilities provided by the Free Software Foundation. With the emergence of Internet and popularity of Linux as the WEB server, there is a strong demand for training IT professionals in the installation, system administration, networking, configuring and programming under Linux environment in the Internet. In view of this situation, this course is designed to provide an effective way for computer personnel with the breadth and depth of the knowledge and skills required supporting WEB server.

A reliable Web server relies on a number of factors including system performance evaluation, appropriate networking tool, Internetworking skills and ample support of CGI commands and PHP. This course therefore emphasizes the application of useful tools such as developing guest book, simple search engine, counter, dynamic HTML by making use of extensive freeware in the Internet. This will enable the administrator to provide a holistic service but secure server to the end user. In addition, this course covers the basic Unix commands and project for a new starter to learn from beginning and demonstrated their achievement through the project with the following knowledge and skills.

- Posses a sound and broad-based knowledge of Unix commands and internals;
- Understand the necessary system administration and installation;
- Be able to use shell programming to monitor the system performance;
- Be able to develop CGI programmes and Perl Programmes to interact with browser and database;
- Possess the abilities to develop X windows application;
- Posses the networking skills to configure the server as an Internet node; and
- Be able to develop useful Internet tools to help end users such as guest book, simple search engine, counter and dynamic HTML.

3 ADMISSION REQUIREMENTS

All the certificate courses are primarily targetted for those who were trained on conventional IT skills and for those who like to develop a career in web design, support, security, e-commerce and digital entertainment. These courses are also for those IT professionals who would like to build up their foundations on Internet related development. The admission requirements are:

1. should hold a Diploma, Higher Diploma or Degree in Design, Computer Science, Information Technology, Information System, Mathematics, Engineering, Business or equivalent;
2. are engaged in Web/Internet related jobs.

4 COURSE STRUCTURE AND STUDENTS' CONCERN

The aims of the course would have been achieved when all the objectives are met in the course. The objectives are reached through a curriculum and a variety of training, teaching methods and approaches used in the delivery of this course. To satisfy the objectives, the Internet related course provides:

- A programme of lectures to allow assimilation of the key components in the Internet computing environment.
- A range of modules to introduce the courses. For example, for Web design course, it covers visualisation techniques, 2D studies, 3D studies, and computer implementation to develop a skilled approach to problem solving and creative thinking through laboratory practices, tutorials and self-exploration.
- A staff supervised project in the last three months to apply the knowledge gained from the taught modules. The project must be a deliverable commercial product or business plan on the Web.

4.1 Learning environment

Many students don't like the conventional approach which packs all the materials together with breath not in depth. They liked this modular approach is that this approach allows 'the students to work at their own pace'. Students felt that this was a particular problem with University courses, which

- are generally time-constrained with too much to pick up in a short period of time; and
- require students to attend rigidly and it is very difficult to keep up if one misses lessons.

The modular nature of these courses allows students to take light exams, as many mature students had been outside an educational environment for a long time. Some expressed the view that asking the lecturer on the flexible training course was less embarrassing. Overall, it was evident that by splitting the areas into a number of courses seems to be a good way for them to gain experience of a learning environment. An advantage of a flexible course is that it should be easier to change course if it does not suit the individual.

Survey was specifically asked whether the approach might have a negative affect on motivation levels. The consensus view was that if an individual was prepared to attend a course then they had the required level of motivation. Of those that had dropped out of the course gave the reason that it was difficult to retain interest without a structure and also due to the workload in the daytime. However, some students felt that the modular nature of courses actually helped motivation. It is suggested that a more formal induction process may well counter some of the negative aspects that are inherent in a flexible learning environment.

4.2 Motive for attending

Whilst a high proportion of students did not know exactly what course they wanted to do they were for the most part clear that they wanted and/or needed to improve their Internet skills. A surveyed identified the reason for undertaking this course as being to get a job, and those who wished to improve their Internet skills related to employability.

Some learnt the Internet skills with the intention of going on to carry their computer job so that he/she would be able to become self-employed or work in a new job. Some took this as part of their continuing education. Only small minorities of students were attending simply to gain access to the Internet.

4.3 Barriers

All course materials are technical based and therefore it would be relatively difficult for IT layman with little knowledge on the use of IT to successfully complete the course. Indeed, except the e-business course that demands business, legal, security and limited technical skills, all the students felt that there is no specific problem on their learning. Another barrier that the students have to solve is to balance their workload and learning. Most of them are very busy with their daytime jobs and have little time to carry out their projects.

5 COURSE FLOW AND OBJECTIVES ACHIEVEMENT

All the courses are described key development components. Table 2 illustrates how these modules relate to the key development themes for the course of Web design. It also indicates where the stated objectives of the course are to be met. As stated in Section two of this paper, each course has its unique objectives achievement.

Table 2 Objective achievement for Web design course

<i>Module of Study</i>	<i>Drawing skills</i>	<i>Design skills</i>	<i>Computer skills</i>	<i>Management</i>
<i>Visualisation Technique</i>	?	?		
<i>2D studies</i>	?	?		
<i>3D studies</i>	?	?		
<i>Technical implementation using PhotoShop</i>		?	?	
<i>Project</i>	?	?	?	?

Here, this Web design course covers the objectives of drawing skills, design skills, computer skills and management as well.

Similarly, Table 3 illustrates how these modules relate to the course of Computer Game over the Web. Here, the objectives are different from Web design, as it covers technical, administrative, programming and management aspects in computer game.

Table 3 Objective achievement for computer game over the Web

<i>Module of Study</i>	<i>Technical skills</i>	<i>Administrati on</i>	<i>Programmi ng skills</i>	<i>Manage ment</i>
<i>Game theory and Ethics</i>				?
<i>Game Project Management</i>		?		?
<i>Computer Graphics Theory</i>	?			
<i>Technical Overview of Game Development using Direct X</i>	?		?	?
<i>Computer Music and Sound Effect</i>	?		?	
<i>Script Writing</i>	?	?		?
<i>Game Development Engine</i>	?		?	
<i>Application of 3D Engine</i>	?		?	?
<i>Project</i>	?	?	?	?

5.1 Mini-Project

A mini-project is mandatory in each course in order to provide students experience in managing, planning and controlling a system development project through the implementation of an application. It also provides an opportunity for integrating and practising the skills covered in the taught modules. Apart from technical implementation, this module covers:

- Design management
- Application of some of the skills, tools and techniques developed during the course to develop an action plan on the Web.
- Identification and definition of system development framework

5.2 Assessment

In order to obtain an award, each student is required to pass written examinations and submit a project of his own choice. The project must be related to the Internet such as computer animation, security action plan, business plan, e-shopping etc. The project must be completed three months after the completion of last module in this programme. To be eligible for the award of the certificate, students must:

1. achieve 70% attendance,
2. pass one written examinations (40%) set by the module lecturers, and
3. achieve a PASS grade (40%) for the project.

5.3 Teaching Schedule

A sample of teaching schedule which consists of four modules, one examination and one project related to Web design is shown in Table 4. Examination is in the format of multiple choice to reduce the students' loading. This arrangement makes them adaptable to the learning environment with less pressure arising from the examination.

Table 4 *Module flow for Web design course*

<i>Sequence</i>	<i>Module</i>
<i>1</i>	Visualisation techniques
<i>2</i>	2D studies
<i>3</i>	3D studies
<i>4</i>	Technical implementation using PhotoShop
<i>5</i>	Exam
<i>6</i>	Project

5.4 Summary of Teaching Mode

Each course is supported by what teaching pattern together with the facilities. Table 5 shows the facilities for the Web based multi-media courses. This enables the students to easily understand the flow of modules and their linkage amongst them.

Table 5 Teaching mode for Web based on multi-media course

<i>Modules</i>	<i>Lecture</i>	<i>Laboratory</i>	<i>Project</i>	<i>Training Platform</i>
<i>Multimedia Project Management</i>	6	6		MS Project
<i>Multimedia Design, production and Management</i>	9	9		Macromedia Director and Authorware
<i>Internet Management</i>	12	15		NotePad, Netscape, FrontPage 98, MS SQL
<i>Human Computer Interaction</i>	9	12		CorelDraw, Acrobat Reader
<i>Internet Programming for Multimedia Application</i>	12	12		Java, Java Script
<i>Computer Music</i>	9	9		16 bit sound card and MIDI interface
<i>2D/3D Rendering and Animation</i>	9	12		MacroMedia Flash
<i>Virtual Reality</i>	9	12		VRML
<i>Project</i>			24	
<i>Sub-Total</i>	75	77	24	Total=179

6 COURSE MANAGEMENT AND MONITORING

A course committee was established to conduct the course according to the regulations. In monitoring the operation and performance of the course the committee was responsible for such matters as admission, curriculum, teaching methods, assessments, evaluation and recruitment of course instructors.

6.1 Course Evaluation

Classes were conducted in three 2-hour sessions a week. As a result, the evaluation involved a qualitative and quantitative approach and focused on four areas which form the basis of the following:

- Effectiveness – to test whether the method adopted by the lecturer is appropriate
- Innovation – the teaching material can help create new ideas in their work
- Impact – how to make use of taught knowledge in their work
- Operational performance – the laboratory exercises are practice based.

Project progress was reviewed against the outcomes proposed in the original application and the project's success was also considered in the context of the aims of the programme.

6.2 Project

Students are paired up to do a project on their own choice. Most of the projects are related to their problems in their jobs. These might cover the security in a small or medium business environment, a multimedia based learning web site, a trading system, a web banner for promotion etc. Generally, there are relatively few on-going technical problems with hardware and these can for the most part be solved relatively simply with support from the supervisor. There were, however, delays in setting up the project because of the IT-based nature of the project.

6.3 Exam process

For the conventional exam paper involving questions, it is well known that it takes a long time for exam papers to be marked. In addition there are some administrative issues with some students being unable to take exams when they are out of town.

In addition students had been confused as to whether they themselves could undertake assessments. In this case, written exam in the format of multiple choice and group project between the students and the supervisor are employed. Multiple choice is used to test students' in breath understanding in all the taught modules, while a project of their own choice is to test students in depth knowledge on a particular area. They are generally required to develop a web site, work out a feasibility, study on security issues, e-business and network planning. They have to go through the process of project management, documentation, coding, verification and presentation. So far, there are over 200 projects that have been implemented by the students. These range from a pizza ordering system to learning courseware. Some projects involve heavily on the multi-media tools such as Flash, Director or VRML, while some involves programming such as JDBC, PHP etc. Some proposals are related to business ideas without the actual implementation such as a business plan to cover search engine and data mining.

Exam board ideally requires an objective, independent project in order to verify the value of individual projects. Students are happy with this arrangement, as there is no delay in the process of projects. For conventional course, some students have become disillusioned, as they have had to wait too long for results. Using this approach, students better understand the process themselves in order that they can explain the importance of an objective assessment process.

A few participated in the course, but did not take formal exams. Of the students who had left the course without taking an exam, the most common reason was that they were not interested in taking an exam, others had thought that the exam would be too difficult. A number of students have suggested that heavy work load have stopped them taking the exam

7 CONCLUSIONS

These certificate courses have proved to be very popular with mature students who may wish to keep up with developments either for career advancement or the acceptance of new responsibilities. These courses aim to provide fundamental design concept, knowledge and skills to students in developing more innovative but practical Web applications, security policy and business applications making use of the Web as a medium. The project has achieved targets in terms of the number of people attending the course and the vast majority of students are positive towards the project they chosen.

The project meets the broad aims of the courses to open up routes into employment for disadvantaged groups. The flexible nature of the project, and the in-depth implementation have been successful. Most notably the project has achieved a particularly high number of real

applications.

By providing the Internet related training, the project has been successful in improving the employability of students who have acquired the old computing skills but not the latest Internet related. A relatively high proportion of students had never designed and implemented the Web applications prior to this course.

At project supervision, students have an informal interview to discuss their training needs. This information is used to fine tune the subject contents. A more formal evaluation is conducted against individual lecturer's presentation skill, subject matters, logistics etc. Both surveys are of benefit particularly given the flexible nature of the project. Whilst this survey result could be reviewed on a regular basis, it would provide an element of structure which would cover milestones and qualifications aimed for.

Given the high skill levels of many students, the role of the lecturer and supervisor is key to the success of the courses. Whilst IT support is adequate for most students, there is a small minority who feel that the support available is not enough. A high proportion of those who cannot balance the heavy day time work drop out. Supervisors are always on hand to support students but at busy times they may be limited in the time they can spend with each individual.

Given the interest in training which the project has stimulated, students would benefit from vocational guidance on a more formal basis. These courses also provide students with routes into further training.

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