

A web-based online postgraduate programme in project management

Qiping Shen¹ and David Scott²

ABSTRACT | The Department of Building and Real Estate of the Hong Kong Polytechnic University has recently developed and implemented a web-based online programme in project management. This programme meets the needs of professionals in the construction industry who wish to acquire new skills and insights as part of their continuing professional development without leaving their place of work for extended and/or repetitive periods. It allows such personnel to learn at their own pace in their own place, with face-to-face supporting workshops. Whereas academic staff members were responsible for the contents of subjects in the programme, a development team was formed to support them with the collection of content material, the development and transformation of the actual content, and instructional design advice on learning in the web-based environment, etc. This paper presents the experience of the team who has pursued the development of the programme into the realms of web-based distance learning. It describes the programme that has been developed, its successes, lessons learnt, and the overall theology that was developed for web-based learning for students of the programme. The opportunities for new methods of teaching and ways of presenting complex ideas are displayed. The use of technology to allow the introduction and innovative use of case studies and continuous monitoring of each student's performance are demonstrated.

KEYWORDS | web-based, teaching and learning, master programme, project management

1 Introduction

The advent of the Internet provides new opportunities and promising potential for distance education throughout the world. Over the past decade, many tertiary institutions have been working towards innovative teaching in distance education, supported by advanced information and network technologies

(e.g. NGA, 2000; ASTD/NGA, 2001). The flexibility in time and place of programmes offered via the web is appealing to learners who need to balance study with work and other responsibilities (e.g. Brown, 2000). The online learning mechanism not only provides flexibility for students, but also makes course materials interesting and stimulating. This stimulation can optimise students' attention, performance and

1. Associate Professor, Department of Building and Real Estate, The Hong Kong Polytechnic University Hung Hom, Kowloon, Hong Kong
Tel: (+852) 2766 5817, Fax: (+852) 2764 5131, bsqshen@polyu.edu.hk

2. Professor and Head, Department of Civil Engineering, Curtin University of Technology Tel: (+61) 8 9266 7573, Fax: (+61) 8 9266 2681,
davidscott@vesta.curtin.edu.au

learning, and has been successfully tested in a number of computer-aided learning projects (e.g. Lavelle, 1992). Because of its inherent cost savings and efficiency of operation, online education is regarded as the future direction of innovative and flexible life-long learning in the 21st century (e.g. McGee, 1999; Brown, 2000).

The Department of Building and Real Estate at the Hong Kong Polytechnic University already has substantial experience in the use of computer-aided learning techniques and the Internet in support of conventional classes (e.g. Shen et al., 2000; Shen et al., 2001; Wong et al, 2002). Building on this experience, the Department has developed an online MSc/PgD programme in Project Management, which has been offered since September 2000 (Shen and Scott, 2001). Online delivery is not simply using new technology as a cosmetic change; instead, it is intended to create new learning experiences and opportunities. This is a challenging and stimulating opportunity for every member of staff involved, and demands the application of Internet technology to education in the project management field.

The development of the online programme is a response to the changing environment in tertiary education enabled by the Internet. The web-based version of the course is designed to meet the needs of professionals in industry, commerce or public agencies, who wish to acquire new skills and insights as part of their continuing professional development, but do not want to leave their place of work for extended and/or repetitive periods. It will allow such personnel to learn at their own pace in their own home, with supporting face-to-face activities.

This paper describes the programme we have developed and implemented, and the lessons learnt from its development, particularly the key areas that affect the quality of the online delivery mechanism, and the overall theology that was developed for web-based learning.

2 Development of the online programme

The title of the online programme is Master of Science (MSc)/Postgraduate Diploma (PgD) in Project Management, awarded by the Hong Kong Polytechnic University. It is a self-financed programme targeted at construction professionals in China. The primary aim of the programme is to provide an opportunity for practising construction managers, engineers, technologists, and other related professionals to broaden and deepen their knowledge of project management in the construction context. It helps qualified construction professionals to develop an innovative approach to problem-solving in general, and to broaden their skills in the field of project management in particular. This will lead over time to the development of more highly skilled, autonomous project management professionals throughout China.

To receive a master's degree, students need to complete ten subjects in total, or seven subjects plus a dissertation. The subjects offered in the programme are as follows:

- Project Management Techniques
- Real Estate Development
- Managing People in Construction and RE Projects
- Construction Process Management
- International Construction Projects
- Development Finance and Investment
- Quality Assurance in Construction
- Property and Construction Law
- Research & Consultancy Techniques for CRE
- Construction Information Technology
- Dissertation (equivalent to 3 subjects or 9 credits)

Experience gained from the project management programme in distance-learning mode and several years of experience in developing IT-based teaching and learning modules in various institutions were used as the basis for developing the new programme. The development of the programme started in early 2000,

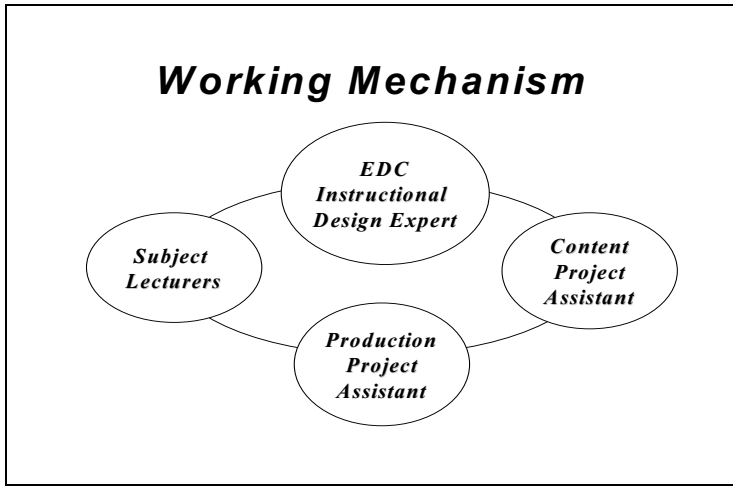


Figure 1. Working mechanism for the development of the online programme

with a major injection of funds from the University. The first batch of subjects was fully developed and successfully validated by a validation panel in July 2000 and offered to students in September 2000. The rationale for the development was to provide more flexibility for our students, so that they can study anywhere, anytime, and at their own pace. The development team for the online programme consists of the coordinator, subject lecturers, instructional design experts, and project assistants. The working mechanism for the development is as shown in Figure 1.

The instructional design experts provide design expertise for the new courseware, whereas the project assistant provides contextual and technical assistance. The project assistants have a close working relationship with the programme coordinator and academic staff of the Department, and interact with the staff of the University's Educational Development Centre.

As a result of this earlier experience, the major objectives of the new learning scheme were:

- To present all of the core learning units of project management

- To allow access to the programme from a wide variety of locations around the region
- To facilitate the learning of the students using appropriate media and techniques
- To allow self-directed and self-paced learning (within practical limits)
- To have facilities to moderate and monitor the learning progress of students
- To employ a mixed mode of learning with an emphasis on remote IT access
- To engage with local partners who would act as mentors and tutors for the students
- To provide an award that is recognised professionally at an international level.

The content of the programme (the individual subjects and the content of those subjects) had been validated by external professional bodies and found to be satisfactory. There was no question therefore that the content of the programme was appropriate and sufficient; the challenge was to present it in a format suitable for the target market. Because the award is no different from any other degrees delivered in the traditional mode of study, the same quality assurance procedures are applicable to this programme. In fact, online programmes have to

overcome one extra hurdle – validation of the delivery mechanism.

The subjects were developed sequentially so that a common framework could be developed, used and carried consistently through the whole programme. The course materials are in the form of online study guides, textbooks, and reading booklets. The study guides for the subjects have been developed specifically for this delivery mechanism. The basic units of the programme are the subjects. Each subject is subdivided into learning units and each of the learning units is further divided into lessons. Within each lesson there may be a number of activities: introduction to the material, directed reading, analysis of material presented or collected by students, and exercises. The composition and content of each lesson were reviewed by an expert group whose function was to provide instructional design advice on teaching and learning structures and procedures. Each learning unit includes at least one “self-assessment” exercise. These items are used to check progress and to allow students to gauge their own performance. The self-assessment, the assignments and some of the exercises require interaction between staff and students or between students and fellow students. As with all teaching feedback, question and answer sessions and general discussion are all important. It was possible to include all of these features in web-based project management subjects. An unexpected bonus that comes from web-based self-assessment and other participating activities is that the subject lecturer can monitor the progress of every student. This is an improvement on conventional teaching procedures, where only those who ask questions or who make it clear that they are having difficulties can be identified and helped.

3 Implementation of the online programme

The programme has been offered in Hong Kong and mainland China both as a university based programme of study and as an in-house training programme for a large construction and property organisation. Students’

progress has been monitored both with direct review of performance and surveys of the participating students. Results of students using the Internet mode have been compared with those taking the same project management programme but using traditional campus-based and distance learning modes. The results and performance of the students in all groups did not vary significantly. This supports the theory developed elsewhere that IT-based learning is no better or no worse than traditional methods, and that “what matters is how you use the technology” (e.g. Ehrmann, 1995). In fact, the main benefit of Internet-based study is the convenience of access and the flexibility of study patterns that are possible, combined with improved communication. A significant benefit from the teachers’ point of view is the facility to monitor the progress of individual students.

Although the Internet was chosen as the principal medium for presentation, it is not used exclusively. The learning process is supported by several face-to-face workshops. This delivery mechanism enables students not only to have the opportunity to study the learning material anytime and anywhere, but also to have the advantage of receiving face-to-face instruction. Using a mixed mode of delivery allows for the inclusion of elements that are not possible for or suited to the Internet, for example textbooks, references and reading material are provided (copyright problems often do not allow their inclusion on the Internet), and workshops and seminars allow interaction and oral presentations by students (voice-based discussion on the Internet has proved to be technically difficult up to this stage). An initial orientation session allowing the students to meet was also found to be useful in establishing an esprit d’corps. However group work, tutorials and general discussion have all been found to be possible using text-based interaction (rather than voice). “Real-time” text-based tutorials have been found to work well provided that the students have been probably prepared and the subject for discussion is adhered to. Examples of some of the work that has been presented to the students and the exercises are given in Figures 2–8.

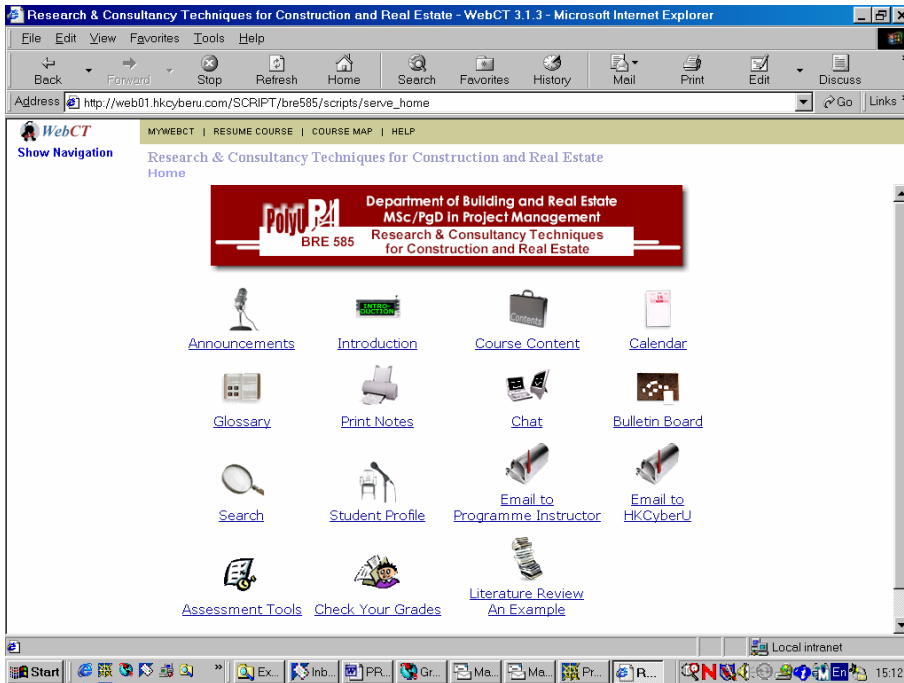


Figure 2. Learning and Teaching Facilities Available for Each Subject

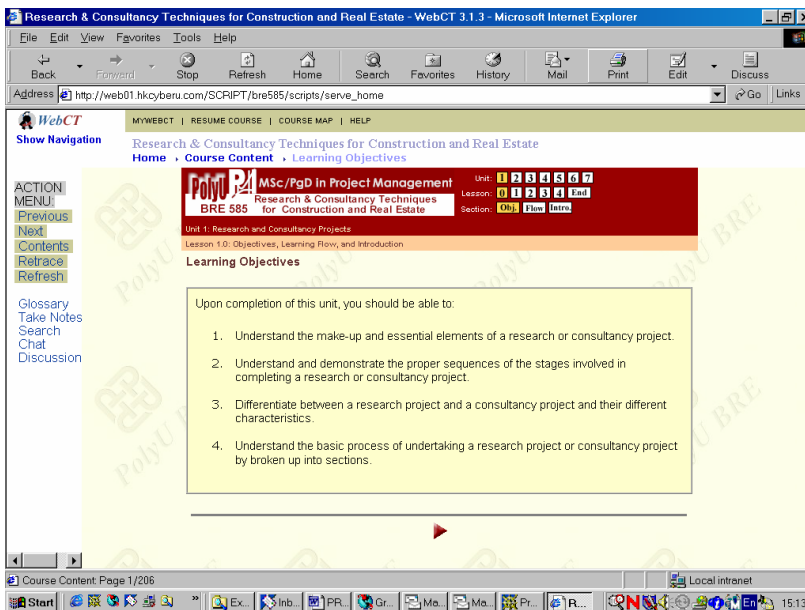


Figure 3. Common Framework for All Subjects in the Programme

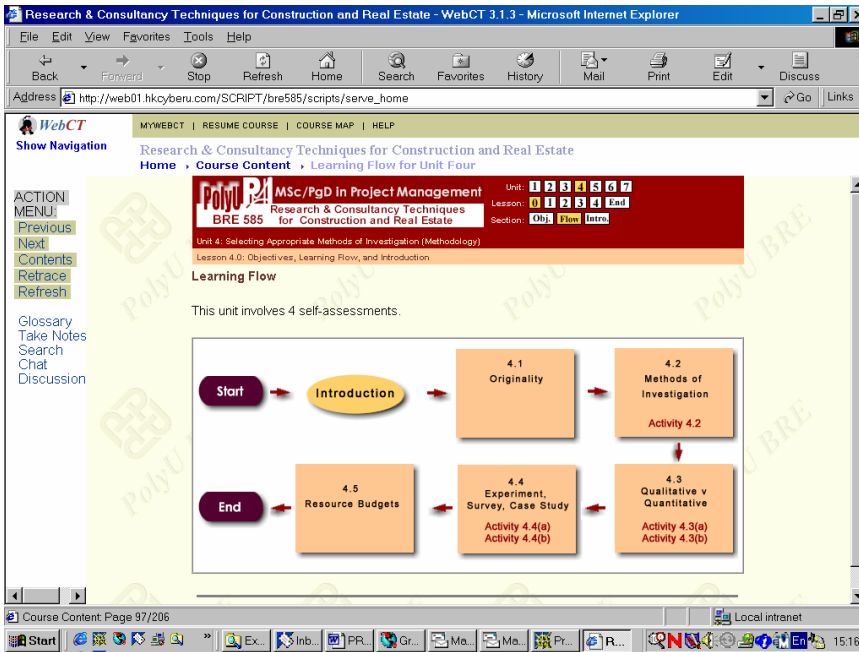


Figure 4. Learning Flow Presented at the Beginning of Each Learning Unit

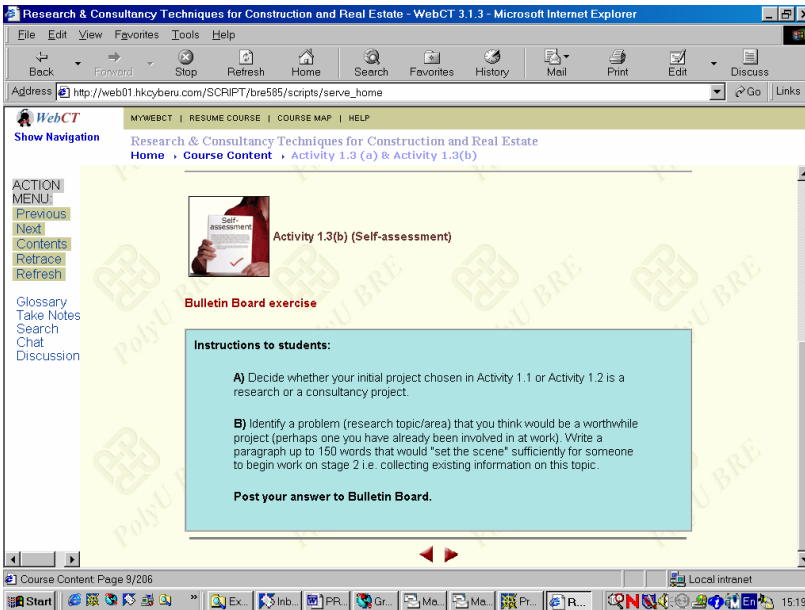


Figure 5. Self-assessments Enable Students to Check Learning Progress

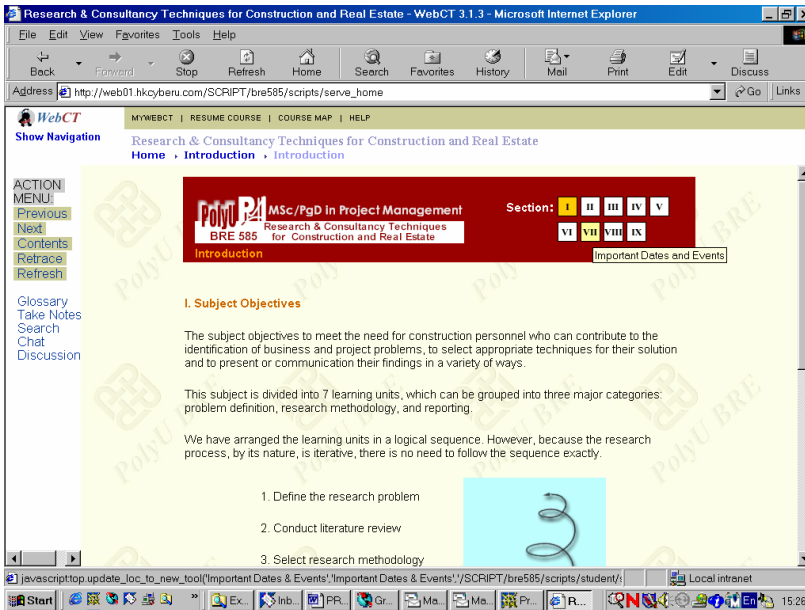


Figure 6. Introductory Unit to Introduce Arrangements for the Subject

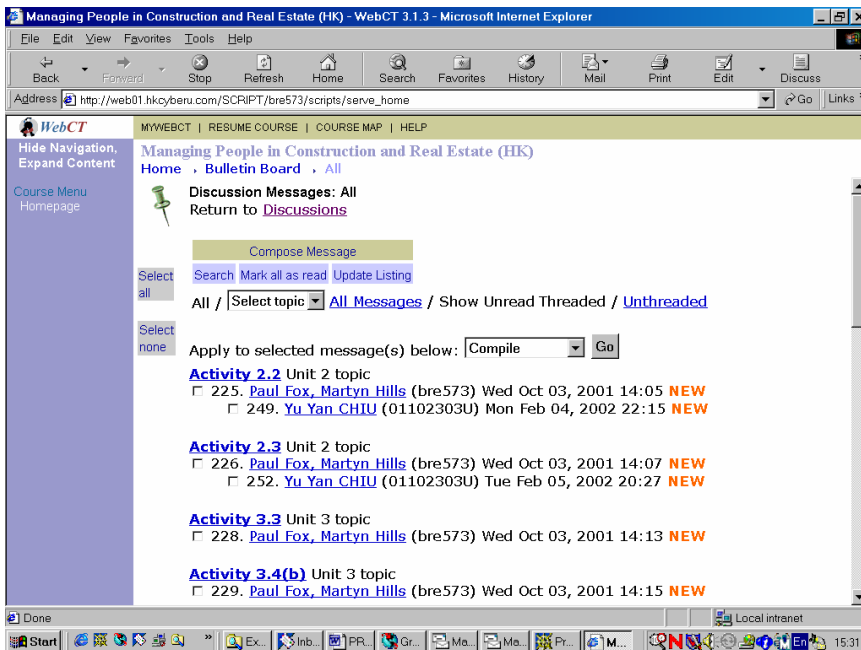


Figure 7. Bulletin Board Used as a Medium for Frequent Interactions

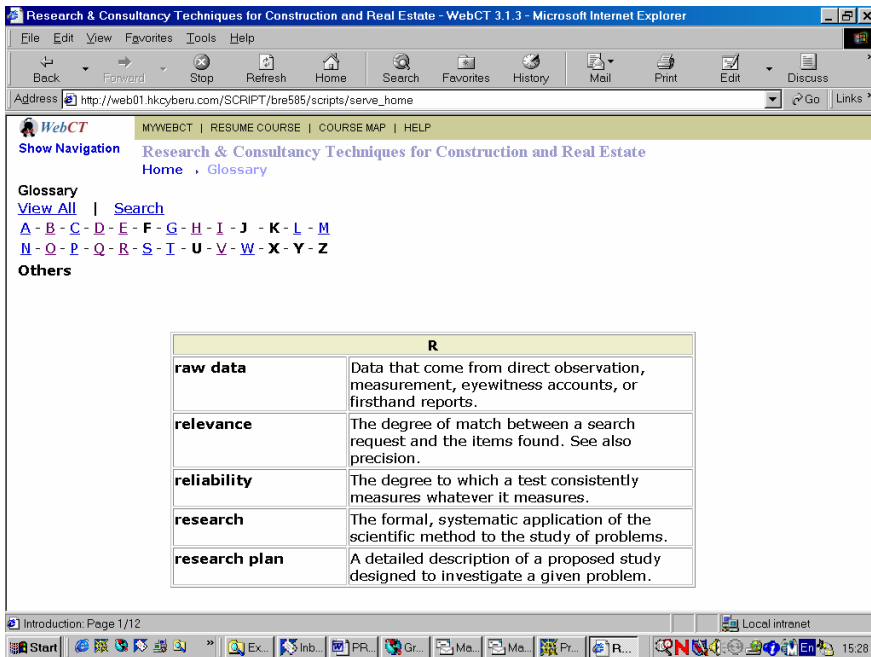


Figure 8. Glossary of Key Terms in Each Subject for Easy Reference

A demonstration that contains a section of a subject can be viewed at the following site (use “visitor” as both the user ID and password):

http://web01.hkcyberu.com/SCRIPT/bredemo/scripts/serve_home

4 Lessons learned from the development

4.1 Creating and Reinforcing a Sense of Community

One of the major problems faced by distance learning students is “loneliness” (Eastmond, 1995). In order to create a strong sense of community among students and staff members, we organise several residential workshops during the delivery of the course to supplement the online learning. These workshops enable students to get to know each other and form study groups. In order to encourage the students

to have more interaction with each other, profiles (including name, academic interests, occupation, etc.) will be used to help students know each other better, and to develop a sense of community.

In each learning unit, students are required to submit their views or answers to the questions posted by the subject lecturers on the bulletin board, and they are encouraged to look at others’ comments. Students may also be required to do a peer review of term papers written by other students. They will learn from each other through comments and will have more chance to communicate with other classmates.

A number of channels have been created, e.g. chat room, bulletin board, email, and face-to-face workshops, to enable students to communicate with each other. Based on our experience, students work closely within their study groups and have frequent informal meetings. The study groups create a sense of belonging and community among students. They

are asked to contribute useful materials (e.g. directed reading) to other students. They are also encouraged to seek help from other students if they have any problems in conducting the activities or in the directed reading. Students are encouraged to participate in the cyber discussions. Their participation is monitored and assessed by subject lecturers.

4.2 Enriching Contents by Using a User-Friendly Interface

In order to ensure the good quality of the programme, the subject lecturers, project assistants and instructional designers work closely to examine and review every learning unit. The contents are carefully examined to ensure that they really help the students to accomplish the stated objectives. In terms of the use of language, we use simple British English for all the learning units, so that the students can grasp the ideas of the content easily. Photos, diagrams and hyperlinks are also incorporated into the learning units to enrich the contents and to present the materials in a more lively and attractive way.

In terms of navigation, a set of icons are made available on each content page so that students can go backward and forward easily in sequence. There is also a clickable roadmap that contains icons at the top right-hand corner, to show students where they are. These icons can be clicked to jump to another page within the same learning unit and to the first page of other learning units. When the mouse is moved over a particular icon, a description 'pops up' to show the name of the learning unit that icon is linked to. When an external website mentioned is clicked, a separate browser pops up to show that webpage content.

In terms of aesthetics, soft colours are employed for the whole subject. Different sessions such as 'Learning Objectives', 'Instructions to Students', 'Directed Reading', etc., are written in different coloured boxes. That colour scheme is also employed consistently in every learning unit of a subject. Charts, photos and

graphics are incorporated into the content pages to illustrate the concepts and to make the web pages more visually appealing. Complex graphics and photos are used selectively and their sizes are controlled to ensure that the transfer speed is acceptable.

4.3 Keeping the Learners Oriented

An introductory unit is given in every subject, separately from the other learning units. Students are advised to read all the sections in the Introduction before starting their study. The Introduction contains several sections, including learning objectives, learning outcome, the learning units of the subject, the delivery mechanism, expectations on students' effort in learning the subject, and the assessment methods and weightings.

A calendar function is available at the homepage to allow students to check for important events and the due dates for submitting particular assignments. This is also accessible from the course content page when students are asked to check the deadline for completing a quiz.

As shown in Figure 4, flowcharts showing the learning process are displayed as progress cues at the beginning of all learning units. These are the visual maps showing what topics and activities the learning units cover, and they are represented by different shapes and colours. A click-able roadmap is also available at the top of each content page, showing which page students are viewing in relation to other content. The icon showing the current position is highlighted in a different colour from the others. Students can also click on a particular icon to jump to another content page.

Icons for lecture notes, activities, directed readings, stimulus questions etc. are available in the content pages separate from the verbal explanations. They act as visual indicators that divide the course materials in different areas and make the content more interesting. A numbering method is used to identify each set

of lecture notes, activities, and directed reading. Checklists for student progress are also available at the end of each learning unit. They remind students what they have learnt after studying all the materials of that learning unit. A search function is incorporated into the content to allow students to search particular word(s) in the content text, titles, headings, and bulletin board articles. Students can access the function both from the homepage and the contents pages (see Figure 2). The Glossary function is available to assist students in finding explanations for difficult terms. Apart from the built-in help functions within WebCT, a telephone help-line will be set up to address technical problems such as connection to the Internet.

Although web-based technologies are advancing very rapidly, we need to be aware of the general level of understanding and use of technology among our students. During the development of our subjects, we are restraining ourselves from using the latest technologies, as can be demonstrated in the system requirements.

4.4 Providing a Variety of Interactive Activities

We have deployed a range of interactions, for example we have built activities and stimulus questions into the content, to encourage students to do exercises after they have studied the materials. The computer will give feedback when students complete the exercise or click on a button to view the suggested answers. Some activities require students to send their opinions or answers to certain questions to the bulletin board, so that other students can share their views and understanding. Tutors can initiate a discussion topic and show their input on the bulletin board. This encourages student interaction in an asynchronous way in addition to the use of email. Some activities also require students to use the Chat room and Drawing board functions, which enable synchronous interactions and communication. As with the interactions between students and tutor

mentioned above, students are encouraged to use email, the bulletin board and the chat room to share their opinions and views with others synchronously and asynchronously. Useful websites related to particular topics are provided in the course materials and readily click-able. This enriches the course content and encourages students to keep in touch with the world.

In terms of learning activities, we have designed stimulus questions and self-assessment activities that appear frequently in the course content. They are usually found after certain materials or directed readings are shown. Instructions will be given every time before students start the activities. Feedback or suggested answers will also be provided after they have completed the activities. Stimulus questions stimulate students' thinking, and suggested answers will be given immediately after they click on the 'Suggested Answer' button. The Activities sections will ask students to start the WebCT Quiz function for accessing the matching or multiple-choice questions. Online feedback and marks to the answers will be given once students submit their responses. In some other activities, students are asked to start the Bulletin Board in order to access the discussion forum to answer the tutor's questions and view each other's feedback. Notes can be taken and retrieved easily when students browse through each content page. They can click on the 'Take notes' icon provided by WebCT to add, retrieve and save their notes in the server, rather than writing them on paper.

4.5 Using Appropriate Methods to Assess Learners

The prime purpose of assessment is to enable students to demonstrate that they have fulfilled the requirements of each subject and have, by the end of their study, achieved the standard required for the award. Appropriate methods of assessment are employed to achieve this purpose. Assessment also serves as feedback to students, so that they may

monitor their performance. Students' performance in each subject will be assessed by both coursework and written examination, except for the subject of Research & Consultancy Techniques for Construction and Real Estate, which will be assessed by coursework only.

For most subjects, assessment consists of two parts, with equal weighting on the final grade: coursework assignments – 50%, final examination – 50%. To complete these subjects, students are required to achieve at least a pass in BOTH coursework AND final examination. Coursework consists of a term paper and online participation. Students are required to submit one term paper to the administrator before the deadline. Instructions for the term paper, which include the questions, assessment criteria, submission deadline, and other requirements, are published online in the Introductory Learning Unit. Students are required to attend a written examination, in person, at the end of each subject.

4.6 Setting up a Workable Implementation Plan

Contingency plan – A CD containing all the learning units can be sent to students for easy access and as an additional reference in case the server goes down. Regular backups – The service provider supports recovery from all system outages. Daily backups are recommended to minimize the loss of user data. Personnel – A full-time teaching staff is employed to support the operation of the programme. This person acts as a one-stop contact person who looks after course-related queries and normal operation. Queries that require intellectual input are forwarded to subject lecturers for their follow-up action.

Security – A password-protected sign-on routine has been developed to control access to the system. Assignments – These are submitted both by email and by post, and students are asked to keep original copies. Examinations – Students are asked to attend all examinations in person.

Staffing & levels of commitment – During the operation of the programme, the subject lecturers take full responsibility for their subjects, such as conducting the workshops, and marking coursework and examination papers. A teaching assistant is employed to help check assignments, and to provide routine feedback and administrative support.

Responding to queries – We have designed the system in such a way that all queries are initially collected by the programme instructor. Depending on the nature of the queries, they are forwarded to the relevant persons for their responses. Administrative queries (e.g. questions about fee payment or programme progress) and technical queries (e.g. problems downloading materials or submitting an assignment) are dealt with by the admin/technical staff, and academic queries (e.g. questions about content) are dealt with by the subject lecturers. Our performance pledge is to respond to all queries within two working days.

Feedback on learning activities – Immediate computer feedback is given when students complete assessments (e.g. quizzes). Suggested answers and hints can be clicked anytime. Immediate feedback can be obtained when a mouse is over the key words. Personalised feedback on particular activities (e.g. Term Papers) is sent directly to students via emails.

Conducting formal evaluation of subjects – The programme committee is fully aware of the importance of evaluation of the educational environment leading to continual improvement. As web-based delivery systems are still in the pioneering stage, it is especially important for subjects to purposely plan for both the formative evaluation of subjects (and to make revisions prior to the first offering) as well as the summative evaluation of each subject. The aim of the formative and summative evaluation of subjects is to have learners evaluate the learning materials and web-based delivery system. Prior to the first implementation, a group of potential students was invited to do a trial run on the WebCT learning platform, and to 'study'

the assigned learning unit. During the trial, they could raise questions and seek assistance from staff if they had any problems. The students are asked to give comments and suggestions on five specific areas in the open discussion session, including the ease of use of the WebCT platform, navigation, presentation of content, interaction, aesthetics and others. After getting the formative feedback, the comments and suggestions were analysed and corresponding action was taken to make further improvements. Summative evaluations are held at the end of each semester by the teaching assistant of the programme. Questionnaires are designed to get students' feedback on the WebCT learning platform, contents and administration. Subsequent actions are taken to make necessary modifications.

5 Difficulties and future developments

Internet-based Project Management programmes are not without their difficulties. The two major hurdles are:

- The time and effort (and hence money) required to develop robust and useful modules
- The technical difficulties that restrict the use of features such as voice- and video-based exercises and other activities.

The time and cost of producing high quality modules will almost certainly lead to exchanges of modules and the interaction of different institutions, each of which will provide their own modules and combine them with modules from other institutions to provide a programme suitable for their own students. This will lead to broader-based and internationally more diverse Project Management programmes. It will also facilitate a "mix and match" programme structure, which will allow students to specialise in particular areas or choose modules that are appropriate to their particular circumstances and activities.

At the technical level, difficulties attributable to transmission speeds, bandwidth, etc. will certainly be overcome in the near future. This will allow voice and video communication in "real time" and the development of "on-site" visits, case studies, etc. Not only will technical improvements overcome current difficulties, but they will also open up new learning possibilities. For example video-based case studies, which require students to participate throughout the case study and which develop according to the student's decision, will add realism and value to the traditional presentation of case studies. Discussion and presentation between groups located throughout the world will allow comparisons of techniques, ideas, experiences, etc. Conference-type tutorials will facilitate the involvement of senior professionals and student classes. Students will be able to work on projects in groups made of participants in different countries, from different industries and with different responsibilities.

6 Conclusions

In this paper, we have described a successfully developed online master's programme offered through the Internet. The working mechanism for the development of this programme was highly recommended by a validation panel that consisted of a group of experts in the field of online education. The lessons we have learnt from this development can be beneficial to other similar developments. The provision of programmes that utilise recent technical and education developments will allow a wider group of participants in project management learning. This will lead to a level of project management training beyond the expectations of even the "best" programmes currently available, and which will include elements and features that cannot be used in conventional training.

- REFERENCES |
- [1] Brown B. L. (2000). Web-based training, ERIC Digest, No. 218, ERIC Clearinghouse on Adult Career and Vocational Education, Columbus OH.
 - [2] Eastmond D.V. (1995). Alone but together: adult distance study through computer conferencing, Gresskill, NJ, Hampton Press.
 - [3] Lavelle D.J. (1992). Promoting student motivation and learning via a systemic introduction to the use of IT, *Computer-Based Training in Property and Construction* (Ed. B. Sloan and N.D. Schofield), University of Salford, UK, pp1–15.
 - [4] McGee M.K. (1999). Train on the Web, Information Week No. 718, Jan. 25, pp. 101–105.
 - [5] Shen Q.P.; Scott D. (2001). Development of an Internet-based Master Programme in Project Management, *4th UICEE Annual Conference on Engineering Education*, Bangkok, Thailand, pp. 170–175.
 - [6] Shen Q.P., Fong P.S.W., Deng Z.M. (2001). Developing an intelligent system for teaching pre-tender cost estimating of office building projects, *Computer Applications in Engineering Education*, 9(1), pp. 26–36.
 - [7] Shen Q.P., Li H., Deng Z.M. (2000). Using Intelligent Multimedia for Expertise-Intensive Training in Construction, *Int. Conference on Construction Information Technology (INCITE2000)*, 17–18 January, Hong Kong Polytechnic University, 404–415.
 - [8] National Governors Association (2000), The state of e-learning in the States. Report of the National Governors Association (NGA) Center for Best Practices.
 - [9] Wong K.W., Shen Q.P., McGeorge D. (2002). Development of a Higher Educational Programme in China – the Hong Kong Experience, *Journal of Further and Higher Education*, 26(1), 81–89.