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Web based distance learning management systems

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WORLD MARITIME UNIVERSITY
Malmö, Sweden



**WEB BASED DISTANCE LEARNING
MANAGEMENT SYSTEMS: AN INVESTIGATION
INTO WMU'S FUTURE NEEDS**

By
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Nigeria

A dissertation submitted to the World Maritime University in partial
fulfilment of the requirements for the award of the degree of

MASTER OF SCIENCE

in

MARITIME AFFAIRS
(Maritime Education and Training)

2001

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The content of this dissertation reflect my own personal views, and are not necessarily endorsed by the University

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ABSTRACT

Title of Dissertation: **Web Based Distance Learning Management Systems: An Investigation into WMU's Future Needs**

Degree: **M. Sc.**

This dissertation focuses on Web based distance learning management systems and the investigation into the potential use of such a system by the World Maritime University. It starts with an overview of the current state of distance learning, its methodologies, the impact of evolution in technology up to the Internet/World Wide Web.

The reasons for and the barriers to the development of Web based distance learning are identified before discussing the areas of the challenges to the WMU's academic standing requiring increasing goals and activities. The technological requirements for hosting or using a Web based learning environment are identified and explained. Also, the pedagogical principles such as learner-centred approach, constructivism theory of education, and interactive learning tasks, on which online course design depends are discussed.

Through the examination and comparison of three of the widely used Web based course management systems, the research presents a detail analysis of the technological features required for creating interactive learning opportunities through a Web based distance learning management system. A working model of a Web based course was developed on one of the examined Web based learning platforms and the trial operations using a test group of WMU staff and students was monitored and evaluated.

The analyses of the examination of the three Web education systems, the trial operations results, and the questionnaire responses received from both staff and students are used to identify the strengths and limitations of Web based distance learning management systems. Based on this knowledge, conclusions are drawn and appropriate

recommendations are made concerning the potential use of a Web based distance learning management system by the World Maritime University.

KEY WORDS: Web based learning, Online learning, Distance learning, Distance education, Management, WMU.

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LIST OF ABBREVIATIONS

AICC	Aviation Industry CBT Committee
BBS	Bulletin Board System
CBS	Copenhagen Business School
CBT	Computer Based Training
CD-ROM	Compact Disc Read Only Memory
CLADEA	Consejo Latinoamericano de Escuelas de Administracion
CMC	Computer Mediated Conference
CRE	The Association of European Universities
ESC	Ecole Superieure de Commerce
GB	Gigabytes
GTTI	Global Telecommunication Training Institute
GTU	Global Telecommunication University
HTML	Hypertext Markup Language
IMO	International Maritime Organisation
IMS	Instructional Management System
J2EE	Java 2 Enterprise Edition
MB	Megabytes
MBA	Master of Business Administration
MET	Maritime Education and Training
MIT	Massachusetts Institute of Technology
OECD	Organisation for Economic Co-Operation and Development
OS	Operating System
RAM	Random Access Memory
TCP/IP	Transmission Control Protocol/Internet Protocol
TV	Television
UN	United Nations

URL	Universal Resource Locator
US	United States of America
WWW	World Wide Web

Chapter 1

Introduction

1.1 Background to the study

The World Maritime University (WMU) was established in 1983 to serve the global maritime community as the International Maritime Organisation's apex institution for high-level maritime education and training, in furtherance of IMO's aims and objectives (WMU, 2001, p. 3). Since its establishment the university has operated in a limited capacity perceived to be market driven and graduating about 100 students annually. However the statistics of applications for admission indicates about three times the size of on-campus opportunities due to limited resource base and infrastructure (Data obtained from WMU's Registry). Also, the globalisation movement in higher education is likely to pose challenges to the WMU in terms of other providers of maritime education using the Internet and other modern distance learning methods to provide education for WMU's potential clients (WMU, 1999, p. 27).

It became pertinent therefore that the WMU should investigate other methods of programme outreach, which can lead to increase in student enrolment, enhancement in its research capabilities and sustenance of its credibility and recognition in academic standing without corresponding requirements for on-campus activities and the implied cost factor. This led to the need to investigating the suitability of Web based distance learning for this purpose for the WMU.

1.2 Importance of the study

Through the findings of this research the WMU will be provided with information on the current state of Web based distance learning, the methods used, the technological features for creating learning opportunities, the pedagogical principles upheld in this learning environment and the inadequacies of such systems for learning purposes. The importance of this study therefore lies in the benefit of informed and effective future decisions that can be taken by the university on programme outreach.

1.3 Purpose of the study

The purpose of this research is:

1. To determine a possible future scope of program outreach to students, graduates and others through the medium of online connectivity
2. To examine selected examples of distance learning Web based management systems and evaluate their potential for use through the WMU network
3. To develop a working model of a Web based course on a selected system utilizing a test group of WMU staff and students.
4. To monitor and evaluate trial operations, identifying any limitations or modifications that are required
5. To draw conclusions and make recommendations as to the potential use of such systems for WMU purposes

1.4 Research Methodology

1.4.1 Research design

The non-experimental research design was used because experimental and control groups were not introduced. The non-experimental research design is one in which the

researcher usually has control over whom or what to measure, when the measurement takes place and what to ask or observe. Sometimes the researcher is interested in a specific event, such as the introduction of a new concept in education, business merger, etc. which occurred prior to the study. This is why it is also sometimes called Ex Post Facto research (Sproull, 1988, p. 149).

1.4.2 Sampling method

The population for this study was divided into the following clusters;

- i) WMU Class of 2001 students
- ii) WMU Class of 2002 students
- iii) WMU staff
- iv) Non-resident lecturing staff
- v) WMU alumni
- vi) WMU prospective students

The purposive sampling method was used for this research. In line with this method, the studied samples were chosen based on the researcher's consideration of the degree of possession of WMU characteristics at the time of conducting the research. Consequently the WMU class of 2002 students were not studied because they arrived the WMU to commence their courses in the week of administration of the questionnaires. The Class of 2001, WMU staff, and non-resident lecturing staff were chosen for the study.

1.4.3 Interval level of measurement

The questionnaire used for this research used the summated rating (Likert-type) scale appropriate for interval level of measurement. For the interval level of measurement, numbers are assigned to objects or events, which can be categorised, ordered and assumed to have equal distance between scale values. The purpose of the summated rating scale is to estimate the subjects overall attitude, opinion, etc toward an object by

summing, and sometimes averaging, over all items. It has the advantage of yielding a single score for several items (Sproull, 1988, pp. 216, 225).

1.4.4 Validity and reliability

In order to ensure the validity and reliability of questionnaire measurements, specific items relating to the construct (opinion about WMU's implementation of Web-based distance learning) were listed and used to build the questionnaire. A pilot study was carried out to measure the strength of the items in measuring the construct before final deployment. Since the same construct had to be measured using three samples of the population, identical questionnaires were used for their responses. Guidford and Frutcher (1978, p. 87) have argued that the correlation of measured variables for such sample groups would indicate the reliability of the instruments.

1.4.5 Data collection methods

Data used for this research were collected using the following methods.

- i) Questionnaires were administered to WMU Class of 2001 students, entire WMU staff, and non-resident lecturing staff.
- ii) Journals, research publications, books, product manuals and overviews relating to the WMU and Web based distance learning management systems were studied and data obtained for the research.
- iii) Web based course management systems including Blackboard, WebCT, and Lecando were examined and compared with respect to their potentials for use through the WMU's network.
- iv) A model Web based course was designed and trial operations monitored and evaluated using a test group of WMU staff and students.
- v) Communication contact was maintained with the three Web based course management systems mentioned above for enquiries concerning their products.

1.4.6 Scope and limitations

Scope

In view of Web based learning methodologies being a fairly new concept, a broad view was adopted to present a clearer picture of the topic. The research started by presenting the larger framework of distance learning within which Web based methodologies are considered. The critical components of an effective Web based learning environment were identified and used as basis for the evaluation of some key commercial Web based course management systems on the market and their potential for use through the WMU network. One of these systems was used to develop a model Web based course and also conduct trial operations using a test group of WMU staff and students. Questionnaires were used to measure the opinions of WMU students, staff and non-resident lecturing staff about the introduction of Web based distance learning management system for the WMU. The research findings were used in recommendations only to the WMU.

Limitations

The survey of the opinions of the WMU population was limited to all resident staff, non-resident lecturing staff, and the WMU Class of 2001 students as it was not possible to include all the sample groups in the survey. Their opinions were considered to be adequately representative of the WMU's aggregate opinion characteristics.

The general examination of Web based course management systems was limited to 12 and the detail examination/comparison of such systems was limited to three, Blackboard, WebCT, and Lecando.

The number of WMU staff and students accepted for participation in the model Web based course was limited to 15 in accordance with the access limitation afforded for the research by the WMU.

This research was constrained to using a wide range of data including tables and figures within the major body of text of the dissertation in order to present a holistic and clearer picture of this fairly new technology, Web based distance learning management system.

Chapter 2

Web based distance learning: The implications for the WMU

2.1 The concept of distance learning

The world economy evolved through the last two centuries from consisting of organisations with manual and clerical workers to knowledge workers with specific skills. This has led to the concept of knowledge-based economy, referred to by Drucker (1988, p. 45) as consisting of organisations composed largely of specialists who direct and discipline their own performance through appropriately designed feedback systems. This diversified specialisation of skills on which the economy depends to function, puts a greater value on the creation and maintenance of such skills through appropriate educational systems. The Organisation for Economic Co-Operation and Development (OECD) (2000) has also pointed out that, the need for workers to acquire a range of skills and to continuously adapt these skills underlies the concept of the 'learning economy', in which knowledge is now recognised as the driver of productivity and economic growth.

The fundamental philosophy of the 'learning economy' has been to make quality education, specific to purpose, available to as many as possible. This involves removing barriers such as posed by the physical distance between potential learners and conventional learning institutions and the difficulties of unfavourable physical classroom lecture schedules considering other work and family commitments.

Initially, the attempts at solving these problems led to the initiative for correspondence study in higher education, in which students could study at home, receiving study materials and sending their work back by post. This system of education can be traced back to the mid-nineteenth century, and was initially most popular in Europe, North America and Australia before spreading to other parts of the world. However, Williams, Parprock and Covington (1999, p. 2) indicate that it was not until 1972 before the term distance education was used to describe this type of education.

In recent times however, it has become very common to find the terms ‘open learning’ and ‘distance learning’ used interchangeably to mean the educational approach in which the learners take responsibility for their own learning and learn at their own pace and their own time. In the following sections both open learning and distance learning are described and the distinction between them is clarified.

2.1.1 Open learning

Open learning refers to a system of education with reduced barriers to access and giving the learners more control over their own learning with respect to instruction, place of study, time and pace for completing specially structured or adapted courses.

The courses are designed to help the learner learn with less help than usual using conventional teaching methods, and may involve any varieties of media such as print, audio-cassettes, television, computer and even practical kits (Rowntree, 1992, p. 16). This might also involve face-to-face tutorials and examination.

2.1.2 Distance learning

Distance learning refers to the learning process, in which the learner is separated from the teacher by geographical space and time for the whole or part of the program using technology to bridge the instructional gap (Willis, 2001, p. 1). This is usually achieved with the help of pre-recorded and suitably packaged learning materials in an asynchronous delivery mode. Through information and communication technologies

today, synchronous distance learning has also been made possible where traditional classroom delivery can be covered by high-powered video cameras and transmitted to students at a distance in real time. This is the concept of the virtual classroom, a distance learning system that combines broadcast and interactive teleconferencing techniques operating in real time to deliver distance education (Schmidt, 2000, p. 82). In another alternative, the materials can be delivered to the distant student using the Internet/World Wide Web, either in real time or asynchronously.

It is important to note that some of the distance education systems being referred to as 'open' such as, the British Open University and the U.S. Community College System, vary greatly in their extent of open entry policy. In support of this fact, Williams et al (1999) also state that:

“...of the 850 distance education systems on the U.N. University/International Centre for Distance Education database in 1996, only 22% had no entry qualifications” (p. 3).

This indicates that most distance learning schemes use admission criteria that are very similar to those of conventional institutions.

2.1.3 Distance learning methodologies

Today, distance education utilises appropriate technology to achieve desired learning outcomes offered through different schemes, sometimes in combination with conventional educational methodologies. It may be offered as a stand-alone course, workshop, lecture, seminar, company in-house training, entire curricula, or different levels of degree/diploma programmes. Typical examples of these methodologies are described below.

2.1.3.1 Distributed learning

Distributed learning refers to the combination of distance learning and the conventional, campus-based learning methodologies (Carr-Chellman and Duchastel, 2000, p. 229).

On campus students, who can access lecture materials in their dormitories, apartments, the libraries, a computer laboratory, or by using their personal computer anywhere in the world if they have to leave campus, can be considered as being engaged in distance learning activities. Varying applications of this system exist, such as in Professor Steffen Schmidt's class of Iowa State University (Schmidt, 2000, p. 84) and Deacon University in Australia where portions of the instructions are 'presential' (face-to-face) and portions are available online (Chellman & Duchastel, 2000, p. 231). This convergence of distance learning and campus-based teaching has led to the concept of distributed learning, a learner-centred approach, in which a number of technologies are employed to provide opportunities for activities and interaction in both asynchronous and real-time modes while still registered as an on-campus students (Bates, 1997, p. 99). This method of distance learning is sometimes also referred to as the dual-mode of learning or flexible learning (Stacey, 1995) as found in Chellman and Duchastel (2000, p. 231).

Another variation of distributed learning has the learner undertaking the larger part of the programme at a distance and the remaining part by physical attendance of conventional delivery. This is particularly popular for programs involving competencies, which can better be developed through practical training under supervision. One example of this method is the Virtual Pilot School, the Lilienthal Project, a cooperation of European flight training schools funded by the European Commission and the Swiss Department of Science and Education. The virtual pilot school offers an integrated system for distance learning in pilot instruction, making use of on- and off-line learning material, CBT sequences, news and discussion groups, online tele-tutor support, and on campus learning seminars. The lectures in foundation courses such as mathematics and the sciences are delivered mainly online with appropriate back-up provided with CD-ROMs. The students are required to take practical flight training on campus after about 14 modules, spanning a minimum of six months online studies. In effect, the students meet with the tutors twice a year. The Virtual Pilot School Web site gives further information on courses. http://www.pilotschool.net/psn/public/info_frame.htm

Another example of this scheme is found in the Australian Maritime College (AMC), Tasmania. The Faculty of Maritime Transport and Engineering and the Faculty of Fisheries and Marine Environment offer studies by distance learning, in which delivery methods such as teleconferences and personal contact with lecturers on interstate and overseas visits are utilised. (Australian Maritime College, 2000, p. 133).

2.1.3.2 Dedicated distance learning

The dedicated distance learning system is one in which the entire programme is offered with the student separated from the teacher in physical space (Bates, 1997, p. 1).

An example of the dedicated distance learning system is the Ecole Supérieure de Commerce (ESC)-Pau's On-line Master of Business Administration (MBA) of the Athena University. The Athena University located in Pau, France is a private electronic campus built on a virtual education environment. The program has accreditation from the French Ministry of Education and the Consejo Latinoamericano de Escuelas de Administracion (CLADEA) The ESC Pau's Online MBA Web site has more information on courses: <http://www.vousi.com/mba/>

2.1.4 Global players in distance education

Some of the global players in distance education include the University of Phoenix, the largest private university in the United States, with 40,000 students and no campus (Schmidt, 2000, p. 76), Britain's Open University with about 200,000 students (The Open University, 2000), China TV University System with about 530,000 students, Turkey Anadolu University with about 577,804 students amongst many other so-called mega universities with annual student enrolment of more than 100,000 (Potashnik & Capper, 1998, p. 44). Williams, et al (1999, p. 18) also add that over 10 countries have open university systems with student population of 100,000 students at any one time.

In the following section the role of technology in the evolution of distance learning is critically analysed.

2.2 Technology and the development of distance learning systems

Right through its development from the days of correspondence study, distance learning has always incorporated available technology into the teaching-learning environment for improved learning outcomes. It is therefore considered that suitably developed technologies have been the driving forces behind today's successes in distance learning. The following are the media, techniques, and technologies that are used in varying combinations for the delivery of learning materials in different distance learning environments. These include, print, correspondence (through regular mail), audio cassettes, video cassettes, broadcast TV, compressed video, interactive TV, telephone, computer-based training (CBT) disks, CD-ROMs, laser disks, personal computer-mediated conference (CMC), audio-graphics, bulletin board system (BBS), electronic mail, satellite TV, short-wave radio, two-way audio teletraining, one-way video/two-way audio teletraining, digital TV, multitasking systems, and increasingly the Internet, World Wide Web, and on-line video.

The Internet is increasingly becoming a primary medium for the delivery of distance education in view of its ability to incorporate images, text, sound, and video, as stored, searchable information with possibilities for both synchronous (real time) and asynchronous communication. The evolution of technological applications in distance learning environments may be summarised as in **Appendix 1** attached to this dissertation.

2.3 Internet and the World Wide Web (WWW): The relationship.

Although the two terms Internet and World Wide Web (WWW) are frequently used to mean the same thing, technically they represent different concepts, which are described in the following sub-sections.

The Internet

The Internet is a world-wide network of voluntarily connected networks of computers that can share information among themselves based on the standard communication language known as Transmission Control Protocol/Internet Protocol (TCP/IP).

These computers may be connected by wires, phone lines, fibre optics cables, satellite links or, combinations of these methods for broadband capabilities. Initially, it started as networks of computers belonging to large organisations that share common goals, such as research institutions, universities, companies and government agencies. There are today, commercial access providers (points) for individuals via modems and personal computers without institutional affiliations to connect to the Internet.

World Wide Web (WWW)

The Internet holds numerous documents with 'homepages' available at numerous sites around the world. These home pages provide links to other documents, images, sound files, databases, and more. The World Wide Web (WWW) is a system of linking documents by way of hypertext and hypermedia.

Hypertext provides the means to move from link to link, or item to item. A link might be a document, an image, or site through specially marked documents. The user normally would click on the link or use the arrow key to move around the web. Moving round the World Wide Web, or browsing, requires a suitable Web program or an Internet browser e.g. Netscape Explorer or Microsoft Internet Explorer (Ellsworth, 1994, p. 539).

The Internet, therefore, emphasises the network of computers while the 'Web' refers to the linkage between the vast resources being held by the Internet.

This vast amount of materials on the World Wide Web, and the Internet's capabilities in incorporating sound, pictures, animations, and films for the design of interactive course materials, open up a new but most powerful tool for creating an environment that provides both teacher and student with an interactive educational platform where group work, social contact, and individual development can be exacted.

2.4 Web based distance education

Based on the foregoing discussions this researcher therefore defines Web based distance education as any formal education process in which the instruction occurs when the learner and the instructor are not in the same place and Internet/Web based technology is used to provide a communication link among the instructor and students.

2.4.1 Stakeholders in Web based distance education

Today, there are numerous Web based distance education programs. Some are part of campus-based courses, others are part of centralised Open Universities and, others are entirely Web-based and are offered in a virtual educational environment, without a physical campus. The students, the tutors, the course developers, the institutions and the educational resources providers are all stake holders in the development of Web based distance education.

2.4.2 Web based distance learning management systems

Web based distance learning management systems refer to Web based software systems that are developed for managing Web based courses for distance learning purposes. They are mostly managed by organisations that do not directly provide educational programs, but are involved in the provision of the course management software for development and distribution of Web based learning materials, management of tuition, assessment, registration, learner support and general administration. Three examples of Web based management systems are given below.

Lecando is one example of Web-based distance learning management systems. It creates the e-learning infrastructure software, which is a platform for Web based flexible and interactive learning using the Internet as a foundation. It allows the learning program to be hosted either on its own server or on the institution's own server.

Blackboard is another example of Web based distance education management system that offers enterprise software products and services that powers e-education infrastructure for schools, colleges, universities and other education providers around the world. Blackboard claims to have 5.4 million users at more than 1,400 institutions powered by the Blackboard e-education platform (Blackboard, 2001a).

Another system for managing Web-based distance education, initially developed by the Computer Science Faculty under a grant from the University of British Columbia in Canada, is the WebCT. It offers a course management system for courses, departments, the virtual campus and the entire learning community. WebCT claims to host 2,200 colleges and universities in 79 countries on its systems (WebCT, 2000a).

2.5 Reasons for the development of Web-based distance learning systems

The appropriate use of technology generally, and the Web based system in particular, leads to the widening of access, improvement of quality of teaching and the assurance of cost-effectiveness of distance education. The phenomenal increase in Web based distance learning networks on the Internet may be attributed to the following itemised reasons:

- i) Through Web based distance education, courses otherwise unavailable on-site because of low enrolments or instructor unavailability can be made available to interested students.
- ii) Web based distance learning systems provide the time, pace, and place flexibility which is a premium decision in today's class and college decisions, and allows educational experience while working or attending to family commitments through powerful synchronous and asynchronous delivery capabilities.
- iii) The Internet has increasing capability and flexibility to incorporate high resolution graphics and colour pictures, text, sound, both as stored,

searchable information and as real time communications with interactivity to create an exciting and stimulating environment for studying on the Web.

- iv) The scalability of one-to-many or many-to-many learning models, the efficiency of delivering just-in-time, and on demand, and the possibilities for life-long learning opportunities have drawn many more knowledge seekers to Web based learning environments.
- v) The Internet provides the platform for the creation of a global education and information infrastructure that is fully intercultural, with students and teachers drawn from all over the world.
- vi) Increasing partnering between network providers and equipment vendors, schools, and corporations, together with decreasing cost of hardware, have helped in the ease of access to and sharing of information, which is very beneficial to the Web as a learning platform.
- vii) Increasing governmental initiative in the creation of broadband information technologies has also led to wider access to and use of the Internet by the greater world population.
- viii) The quality of learning experiences is believed to be enhanced by Web based distance learning through its highly student-centred approaches and well prepared learning materials characterized by zealously created motivation in the form of interactive activities.
- ix) Web based education encourages collaborative learning and teaching processes where the students are encouraged to contact each other and the teacher while sharing ideas.
- x) Web based distance learning is expected by policy makers and administrators to reduce cost of education, improve productivity, and enable expansion without corresponding cost increase.
- xi) There is the current perception that the application of information and communication technology will enable institutions to be seen to be keeping

up-to-date in technology, and increase their market share in an environment that is increasingly competitive.

- xii) The Web provides a link between vast reservoirs of learning resources that become very useful as learner support resources in this learning environment. Such resources would include online journals, articles, research publications, databases, etc.

For further reading, please see Schimdt, 2000, p. 80; Garison & Borgia, 2000, p. 208; Farrell, 1999, p. 5; Bates, 1997, p. 94.

2.6 Barriers to the development of Web-based distance learning systems

The following are the factors that have hindered the development of Web based distance education:

- i) The lack of properly trained staff in the development of Web based instructional materials ensuring quality of learning.
- ii) Unfamiliarity of both students and teacher with the nitty-gritty of Web technology also poses a barrier to the development of web based distance education.
- iii) Perceptions and fears by learners about the recognition of educational awards.
- iv) Isolation from other learners is one factor that has discouraged potential learners from Web based distance learning programmes.
- v) Resistance to change by teaching and training professionals arising from internal perceptions and fears related to themselves, their students and the technologies.
- vi) The worry by some teachers about intellectual property rights, and copyright restrictions on the use of material do not promote sharing through collaborative and broad international delivery models.

- vii) In many parts of the world there is simply no access to networks and in many others the cost of access through sufficient bandwidth is prohibitive.
- viii) The fear by policy makers that, in view of the wide disparity in quality access, adopting this learning technology will result in the widening of the gap of education between the rich and the poor.
- ix) Many are concerned about the issue of examination malpractice and the inability of the widely used multiple choice questions assessment method to measure higher order knowledge and creative thinking.

For further reading, please see Schimdt, 2000, p. 80; Garison & Borgia, 2000, p. 208; Farrell, 1999, p. 5; Bates, 1997, p. 94.

2.7 Implications of the development of Web based distance learning for the WMU

The concept of distance learning has been analysed in consideration of the various influencing factors including the dedicated and distributed Web based learning schemes. Also, the impact of technological advances on the evolution of distance learning, leading up to the very powerful Web based platforms has been considered. The reasons for the very fast growth of this learning method as well as the impediments to its acceptance by some have also been investigated.

2.7.1 Global Role of the WMU

Since establishment, the WMU has built on an excellent reputation of supplying highly competent manpower to the international maritime community. This manifests in various ways including, the strength of participation of its graduates in the IMO's projects and the high level management positions being held by its alumni around the world. In July 2001, the Convention of all the 'Fellows' of the Sasakawa World Maritime University Fellowships since inception, administered by the Tokyo Foundation, was held in Japan. That event was a further emphasis on the impact of the WMU in

creating intercultural and international harmonization of practices especially in the maritime world.

2.7.2 Challenges to WMU's academic standing

Despite the above mentioned landmark achievements, the University still faces challenges relating to limited capacity, both in terms of goals and activities as well as size, and competition from other Higher Education Institutions. Other challenges include, keeping the growing alumni updated on the latest technology in the maritime industry and of the future of global developments and enhancement of its research capability in view of growing needs for proactive decisions in the maritime industry.

Statistics obtained from the WMU's Registry indicates that the number of applications for admission in recent years has always been about three times the available capacity of the university. Three hundred and sixteen (316) and Two hundred and eighty-four (284) candidates applied for admissions in 2000 and 2001 respectively for the same available one hundred and eight (108) positions.

Despite the uniqueness of the target source of WMU students, potential competition by other institutions in the training of graduates who are competitive in the international job market have to be acknowledged with the view to possibly converting the threats into opportunities and strengths. A close example of this case in point is the development of some similar maritime business courses as the WMU at the Copenhagen Business School (CBS), one of the foremost business schools in Europe with a student population of 14,000, just 20 minutes travel distance from the WMU.

The conception of the WMU is that of the focal point of the world-wide system of providers of maritime training and development. It is therefore important for the WMU to consider establishing an instrument, which will enable it to continue to perform an effective role as a focal point for other suppliers of maritime training and fashion out alliances with them.

The institutional audit of the World Maritime University by the Association of European Universities (CRE) strongly acknowledges the above noted challenges to the University. The Audit Report in WMU (1999) notes that:

“...many of the trends of the next 5-10 years in higher education are likely to result in rather more diversified institutional goals and efforts, e.g. lifelong learning, distance learning, contract research and development, Internet challenges etc. More goals and activities usually mean increased size and institutional scope” (p. 14).

The problem of increasing goals and activities is rightly linked to the challenge for increase in size. But limitations of physical and funding structures place the University in a very difficult position to host the necessary increases in its activities on the Malmö campus.

However, the inevitability of the need for engagement in new activities was emphasised by the Audit Report. The Report in WMU (1999) held that:

“...if the WMU is to sustain credibility and recognition in terms of its academic standing, it will need to enhance its research capability, which also would enhance its standing amongst clients in terms of underpinning teaching, transferring of knowledge etc” (p. 14)

This observation by the Audit further confirms the challenges facing the WMU that were earlier identified by this research to include enhancement of its research capability in view of increasing needs for proactive decisions in the maritime industry.

2.7.3 The potential of Web based distance learning for WMU capacity development

Web based distance learning provides the means for global delivery methods, globally distributed delivery points, and global strategic alliances and networking which, are critical factors for the WMU's scope of activities. Web based distance learning is therefore identified by this research as a very suitable instrument for satisfying WMU's institutional challenges, be it a limitation in capacity or competition from other

institutions of higher learning. The Audit Report in WMU (1999) acknowledged this potential and recommended that the University should:

“...reasonably evaluate, the possibilities of putting out modules (of its courses) on the Internet or CD-(ROMs) for those who would find a two year full-time programme difficult, (and) delivering parts of the programme (e.g. Certificate Level) in other institutions” (p. 35).

The WMU programme now incorporates the elective system in modular format. Under this system, fourth semester students are allowed to choose the focus of their specialisations by selecting from offered elective courses. Some of these elective courses have to be taken by specialist non-resident professors who, are for the most part of the semester separated from the students. This further emphasises the need for the establishment of a learning platform where a part or a whole course programme can be delivered to on- or off-campus students by either resident or visiting professors with less dependence on time and physical distance between the teacher and the student.

In the following chapter, the research concentrates on defining the critical components that make a successful Web based distance learning management system that can provide an exciting and motivating distance learning environment, and also assure quality. Based on this knowledge, a suitable distance learning management system will be selected for model testing using a test group of WMU students.

Chapter 3

The web based distance learning environment

3.1 Pedagogical issues

Web based distance learning environment has been described in Chapter 2 as a learning platform that is hosted on the Internet, through which the Internet and the World Wide Web (WWW) technologies are utilized in the design of suitable learning opportunities for learners separated from their teachers by space and time. Learning in this environment is sometimes referred to as online learning. These technologies afford distance learning management systems the capability of incorporating sound, pictures, animations and films for the design of interactive course materials, which can be delivered either in real time or asynchronously to distance learners. The reasons for the fast growth in this network of learning platforms have often been linked to accessibility, flexibility, cost effectiveness and improvement of student learning. The improvement of student learning in particular may be explained in terms of the advantages of online communication, collaboration, information storage and access.

Technological opportunities: A consequence or an event?

Elsworth (1994, p. 433) has pointed out that distance education methods in general and Web based methods in particular require careful, thorough, up-front planning concerning forming intellectual opportunities, fashioning contextual systems and community building. However Oliver (1999, p. 241) has argued that, the literature suggests that the

assumed benefits of online learning are sometimes not met due to the failure of online learning environments to deliberately create enhanced learning processes and learning outcomes. This researcher agrees with these arguments and considers that, in the circumstance where Web based technologies are not deliberately taken advantage of in the design of online courses, such an environment can become an impediment to learning due to the lack of planning and inappropriate application of technologies. Therefore, the capability of online learning technologies in improving student learning must not be seen as a consequence but as an event, which is deliberately planned.

Taking these issues of concern for the deliberate and timely planning of Web based distance learning together indicates the need for a pedagogical re-engineering of this system of education. This implies that, the learning opportunities that are provided by the new technologies have to become the defining principles of online teaching pedagogy. The following section takes a look at the suitable educational theories to explain the context in which Web based distance education should be presented.

3.1.1 Knowledge construction and online learning

The constructivism theory of education emphasizes that learning is a process of personal understanding and meaning construction, which is active and interpretative. This theory views learning as the construction of knowledge and not the memorization of facts (Oliver, 1999, p. 242). Bonk and Cunningham (1998, p. 32) also posit that constructivism has extensive implications for the use of collaborative learning tools and argue, with reference to Brooks (1990), that in this domain some teachers believe that better learning occurs when knowledge is the result of situated construction of reality. Situated learning, Oliver (1999, p. 242) explains, is a concept that recognises the value of learning within settings which learners reflect the purpose of learning and the varying applications of this knowledge beyond the 'classroom'.

This researcher also recognises the relevance of constructivist learning principles in an online learning environment. These principles include the provision of the awareness and experience of knowledge construction process, the creation of relevant, multi-modal, and interactive learning tasks, and the involvement of social experience in the learning process.

The potential of electronic collaboration tools in knowledge construction is however not a new realization. For example, Piaget (1963) as found in Bonk and King (1998, p. 4) asserted that electronic collaboration tools could foster debates and eventual differences in opinion; the resolution of which the referencing authors argue should encourage students to decentre their own views. This is the process of higher knowledge construction. McAlpine (2000, p. 69) reasons that through collaborative learning processes learners become aware of the existence of multiple points of views, and that advance knowledge construction needs to take this into consideration.

3.1.2 Pedagogical implications of online distance learning

The basic pedagogical design of an online course is different from that of a conventional face-to-face classroom course. While there is no distance hampering communication between the student and teacher in the conventional classroom, technology mediates the communication between the online student and his instructor. This implies that efficient technologies must first be available and then applied effectively in the design of interactive Web based courses so as to retain motivation in the students throughout the duration of the course. The interaction of learners with colleagues and their teachers, also referred to as collaboration, leads to knowledge construction, an educational theoretical concept on which online course pedagogical design relies on.

Naidu (1997, p. 270) indicates one major pedagogical difference in an online course design. That the study materials comprise of an outline of the topics of the course and students are expected to use this outline and brief commentaries on the topics to search the Internet for resources and then share these with their peers via the various

communication and collaborating tools. Also, Kirkwood (2000, p. 255) argues that online pedagogical design requires the provision for the learners of the flexibility to plan and execute a personal study pattern that meets their particular needs. Often, in an online learning setting, the students will undertake cost-benefit analysis, choosing to devote their time and attention only to those learning materials and components that enable them to satisfy the course outcome requirements and their personal goals. The opinions of these authors point to the need for an entirely new approach to the pedagogical design of an online distance learning program, taking cognisance of the learner-centred approach that is involved.

3.2 Characteristics of Web based distance learning environments

Distance learning on the Internet is different from that through other forms of instruction. Elsworth (1994, p. 430) indicates high-speed access and retrieval, time and place flexibility, possibilities of synchronous and asynchronous communication and non-linear and linear learning approaches, but without audio and visual feedback, as characteristics of Web based learning. Interestingly, the speed of evolution of this learning system becomes apparent in today's obsolescence of Elsworth's opinion in 1994 (just 7 years ago) that distance education on the Internet did not contain audio and visual feedback. The use of these facilities is now possible with the Internet. With the 56 kilobits per second (kbps) Internet modem, 475 kilobytes of audio can be transmitted in 1.14 minutes while 2.4 megabytes video can be transmitted in 5.7 minutes. The High Speed Cable Modem can transmit the same quantity of data in 0.38-0.13 seconds and 1.9-0.64 seconds respectively, and 850 pages of A4 paper document in just 2 seconds (Muirhead, 2001, p. 3, Slide 4). The above data serve to present the picture of what is possible through the Internet as at today.

With respect to place and time flexibility, education no longer has the exact place and time of lecture delivery as the requirement for learning as the lecture can be put on the

Web for the students to learn anywhere and at their convenient time. Synchronous communication, where users are communicating in real time, and asynchronous communication, which do not require the participants to be involved in communication simultaneously, are tools which make Web based distance learning very resourceful.

The combination of non-linear and linear learning, Ellsworth (1994, p. 431) explains, means that the learning can be structured by the teacher or learner allowing for a self-planned pace in the process. The student can, for example, undertake the study in the traditional start-to-finish style, or by using the interactive hypertext based systems that enable newly discovered concepts to be explored using the vast resources of the World Wide Web.

3.2.1 Web based course management system

As mentioned above, the Internet and Web based technologies are used for creating the environment for managing Web based courses. However, creating a suitable environment or the platform on which a Web based course is offered requires far more than the basic skills of creating Web pages with content and possibly with e-mail and chat services (Siekmann, 2000). The right framework requires appropriate security for the instructional materials and activities to be undertaken on this environment, suitable database management system, and compatibility between participants' systems amongst many other features. An organized system, where the exact capabilities with respect to communications, formats for course content organization, files management, exercise and assessments methods, and course and student management features are installed and the procedures clearly defined is required. This normally involves features such as automated scores transfer, facility for tracking student participation in learning activities, tracking student progress report and managing course and results statistics. Any Web based system that performs these functions defines a Web based course management system, which is sometimes referred to as an online learning platform.

A Web based course management system provides both teacher and student with an integrated and interactive educational tool where group work and social context provide opportunities for individual development (Telia, 1999).

However, the objectives for using Web based course management systems are many and varied, ranging from conventional educational institutions offering part of their programmes online to increase their accessibility to prospective learners, to traditional teachers and researchers wishing to use the connections of the World Wide Web to disseminate their ideas, and to virtual campuses, running their programmes entirely online. Three of the leaders in the field of Web based course management, to be analysed in detail in this research, amongst others include, Blackboard Incorporated, WebCT Incorporated, Lecando AB.

3.3 Required technology for Web based course management system

In order to design a flexible Web based course management system for delivering different types of courses, appropriate technologies must be incorporated into the system. For the purposes of this research, two categories of technologies may be identified within a Web based course management system. One category is the technologies on which the platform is founded, and the other the technological features that enable the design of the learning opportunities. In the following section the foundation technology is described before concluding with the description of communication tools used in Web based distance learning.

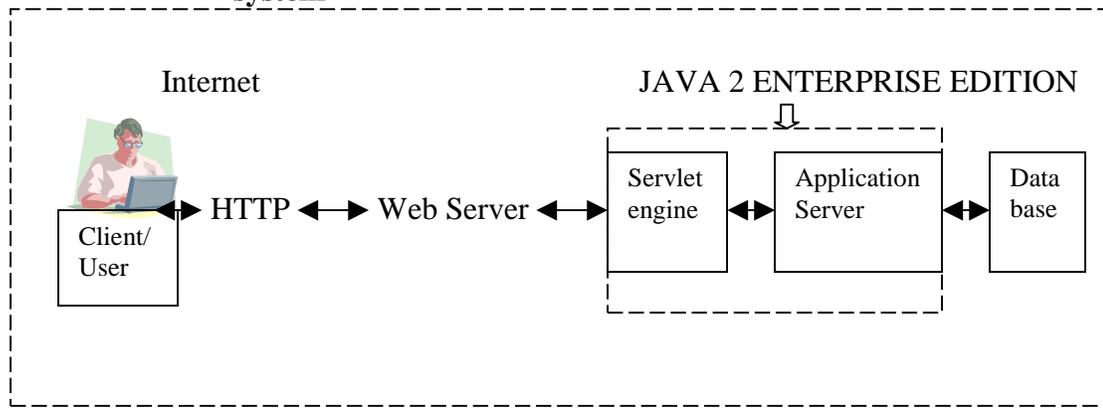
3.3.1 Foundation architecture

Web based course management systems are hosted on the Internet server with standard products like Java 2 Enterprise Edition (J2EE) or Microsoft Access with database manager. The educational course or programme may be hosted on the platform's server or on the institutions own server and connected with the platform's server. A course

participant who enters the institution's Internet Web page and clicks on the appropriate link is connected to the site of the course (Lecando, 2001b, Sida 2 av 41; Telia; 2000, p. 2).

The general foundation architecture may be represented as below.

Figure 3.1: Foundation architecture for a Web based course management system



Source: Adapted from Lecando Enterprise Server

Similarly, the foundation architecture of Blackboard 5, for example, is three tiered. It encompasses a database on the back end and a Web server interacting with the Blackboard application (written in object-oriented Java and Perl) in the middle, accessible by a browser on the front end (Yaskin & Gilfus, 2001, p. 5).

Hardware and software requirement

For clients of Web based course management systems, such as institutions, the hardware requirements are derived from individual data and the number of active users, defined as individuals enrolled in the course. This ensures that one student who is enrolled in multiple courses is registered as a multiple accounts holder. An example of hardware requirement is Blackboard's hardware requirements for more than 3000 active users but fewer than 6000 active users, which include:

One server configuration

Quad processors. Pentium III 700 MHz Xeon processors or Sun, UltraSparc-II
450 MHz processors

4 GB of RAM

Appropriate amount of hard drive space in a RAID array

10/100 network interface card

The table of Blackboard's Hardware Requirements for different numbers of active users is attached as **Appendix 2** to this research.

The end users of Web based course management systems require a computer connected to the Internet in order to access the system. In addition, the user requires a browser that enables the specific Internet server. For example, Java enabling browser such as Netscape Navigator 4.7 or later or Microsoft Internet Explorer 4.01 or later for Java 2 Enterprise Edition (Lecando, 2001b, Sida 2 av 41).

Additional software requirements

Some courses contain audiofiles, animation tools etc that require additional software or plug-ins such as Real Player or Windows Media Player to be installed on the users' computers.

Access requirements

Web based course management systems operate a password protected online environments. The user requires a username and a password to login to the environment. Although some systems like Blackboard Inc. and WebCT Inc. provide a course management programme that can be downloaded free for evaluation purposes, a license has to be purchased before students' accounts can be created.

3.3.2 Communication features

The varieties of Web based technologies used for creating learning opportunities mentioned in Section 3.2.1 have been critically analysed in examining the Blackboard, WebCT and Lecando Web based course management systems in the following Chapter 4. However, this chapter is concluded with the detail description of the range of communication tools used in the Web based learning environment.

Communication facilities afford students the opportunity to pose questions, discuss ideas, analyse information, and synthesise concepts. The following communication features are common in a typical Web based course management environment.

i) Discussion board or global bulletin board

This is a facility for asynchronous communication between course participants and the tutor and for carrying out tasks related projects by different project members. Any material posted on the bulletin board is for public use.

ii) Electronic mail (E-mail)

The electronic mail is both the simplest and most widely used Internet tool (Moody, 1996, p. 49). It is used for asynchronous communication, and utilizes the Universal Resource Locator (URL), which is the Internet address system employed by Web browsers. A Web based management system may use internal or externally connected e-mail service. In the case of externally connected mail service, the user can receive and send mails outside the domain of the management system. Sometimes the quota of external mails allowed per participant is determined.

iii) Chat.

This is real time, text only, written communication. The chat may consist of a global chat area accessible by anybody within the system or a private chat for inviting members only.

iv) Whiteboard.

The whiteboard is another synchronous communication tool used for drawing figures and colouring where required. It is primarily visual but text may be added, sometimes through the use of multiple windows.

v) Virtual classroom

In this environment, text, images, and sound are utilized for both synchronous and asynchronous lecture delivery on the Internet. In the asynchronous delivery mode, the delivered lecture is recorded and conveyed to students, and the learner can access the delivery as it was in real time. The virtual classroom can incorporate an area for slides or drawing, a chat window, and a question box into one tool.

vi) Video conferencing

Video conferencing provides the capability to interconnect two or more parties with both audio and video. A minimum requirement is of microphone, speakers and video camera attached to the computer with the right software.

vii) Netmeeting

This is a generic name for meeting between parties within a network of computers, including the Internet. Netmeeting is a powerful tool that enables real-time communications and collaboration over the Internet. The facilities within a netmeeting programme normally involve a combination of any of the following; chat, whiteboard, video conferencing and file transfer and sharing.

viii) Digital dropbox

The digital 'dropbox' is a tool that allows file exchange between participants such as the instructor and students in an online learning environment. The 'dropbox' works by uploading a file from a disk or computer to a central location. A participant can

then download the file to work on locally. The student can download the file, work on it and send it back to the instructor for record keeping, grading, or comments. The drop box tool is useful in administering assignments and other task related activities.

ix) Project area

The project area is a private area that can be created by anybody in the environment for sharing files and having a common forum for discussion with members of a particular project. This is a feature that is useful for task-oriented activities.

x) Calendar

Another tool useful for communication purposes in an online learning environment is the interactive calendar used for publishing and editing the programme of events. Any participant in this environment can post events visible and printable by others. Also, a participant can copy the calendar data to own computer and edit as deemed necessary. A calendar may be prompted to deliver a message on the events/schedules of the day to the participants on login.

For further information, please see WebCT, 2001b; Lecando, 2001b; Yaskin & Gilfus, 2001; Moody, 1996; Elsworth, 1994.

Chapter 4

Examination of some Web based distance education management systems

Introduction

In the previous chapter the characteristics of Web based course management systems as well as the technological opportunities the systems offer for learning were discussed in detail. In this chapter the list of the major Web based management systems in the market is compiled (Table 4.1) and the detail examination of their features is organized in the table of comparison of these features (See Table 4.2). Furthermore, the critical analysis of three of some of the most widely used of these systems, Blackboard, WebCT, and Lecando is carried out with the view to identifying the strengths and weaknesses of these systems generally, and in particular those of the Lecando system to be used in developing a working model of a Web based distance learning course using a test group of WMU staff and students.

4.1 Comparison of Web based education systems

The following table of comparison of Web based education systems has been adapted from Hall (1999), modified and expanded upon by one system, the Lecando system, through questionnaire data obtained from Lecando (attached as **Appendix 3**) and personal evaluation of the Lecando, Blackboard, and WebCT learning platforms. A wide

knowledge of the systems that are available and their respective features is therefore an imperative for an appropriate choice being made. The comparison has been divided into the following sections of features: administrative, instructional, and developmental. The list of Web based course management systems or online learning platforms to be compared, together with their identification on Table 4.2 are presented below.

Table 4.1: List of some Web based course management systems

Web based course management systems	Identification Number on Table 4.2
Blackboard	1
Convene	2
Embanet	3
.eCollege	4
Saratoga	5
Symposium	6
TopClass	7
WebCT	8
Course In A Box	9
WeMentor	10
PsyCo	11
Lecando	12

Note: * on the table indicates an updated entry different from that of reference document
na on the table indicates “not applicable”.

? indicates unavailability of data.

Y represents a Yes – indicating the availability of the feature.

N represents a No – indicating the unavailability of the data

Table 4.2: Comparison of Web based Education Systems

S/No.	Features	Management system's identification number											
		1	2	3	4	5	6	7	8	9	10	11	12
	Administrative												
1	University will have sole ownership of custom code used to create courses.	Y*	Y	Y	N	N	Y	N	Y	Y	N	Y	Y
2	University will have sole ownership of course content.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Platform provider will provide technical support to University students.	N	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y
4	Platform provider will provide technical support to University faculty and staff.	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
5	Platform provider will host courses on their server.	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y
6	Platform provider will advertise courses.	N	Y	Y	Y	N	N	N	N	Y	Y	Y	Y
7	Platform provider can provide documentation and contacts to demonstrate a positive track record of higher education.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	Pricing structure is based upon number of student in the course	N	Y	Y	Y	Y	Y	Y	Y	N	Y	na	Y
9	Platform is focused on locally developed course as opposed to "canned" courses.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
10	Platform has large startup cost with minimal continual costs.	N	N	N	N	Y	N	N	Y	Y	Y	na	N
	Instructional												
11	Platform choice can be customized to incorporate institution's distinctive needs.	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
12	Platform provides asynchronous communication facilities.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
13	Platform provides synchronous communication facilities.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
14	Faculty can make their own changes to content.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
15	Training is provided for faculty.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
16	Courses can have a consistent interface.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
17	Platform supplies access to library resources other than the University's present holdings.	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	N
18	Access to library resources requires an additional charge.	Y	N	N	N	N	Y	N	Y	Y	N	N	N
19	Online help is available to help student use library resources.	Y	Y	N	Y	Y	Y	N	Y	N	N	Y	N

Table 4.2 continued

20	Platform includes e-mail client.	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N
21	Platform has e-mail management capabilities for students.	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	N
22	Platform has e-mail management capabilities for faculty.	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	N
23	Platform supports multiple instructors for a single course.	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y
	Developmental	1	2	3	4	5	6	7	8	9	10	11	12
24	Content format will allow for simple transfer to/from another vendor's platform.	Y	Y	Y	Y	Y	Y	Y	Y	N	N	na	Y
25	Platform uses open data standard to allow communication with existing University database applications.	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y
26	Content can be authored on PCs running Windows 95/98/NT.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
27	Content can be authored on Macintosh running OS 7.5 or greater.	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
28	Courses can be taken using PCs running Windows 95/98/NT.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
29	Courses can be taken using a Macintosh running OS 7.5 or greater.	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
30	Platform is compliant with Instructional Management Systems (IMS) standards within product.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	?	Y
31	Platform is compliant with Aviation Industry CBT Committee (AICC) standards within product.	Y	Y	N	Y	Y	Y	Y	Y	N	Y	?	Y
32	Platform utilizes standard HTML for content creation.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
33	Platform is structured so students can view all their current courses when they log on.	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y
34	Platform's server software will run on DEC Unix.	Y	Y	N	N	Y	N	N	Y	N	N	na	Y
35	Platform's server software will run on Windows NT.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	na	Y
36	Multiple-choice questions can be created/scored with platform's authoring software.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
37	True/False questions can be created/scored with platform's authoring software.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
38	Matching questions can be created/scored with platform's authoring software.	Y	Y	Y	Y	Y	Y	Y	Y	n	Y	Y	Y

Table 4.2 continued

39	Short answer questions can be created/scored with platform's authoring software.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
40	Essay questions can be created/scored with platform's authoring software.	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	?	Y
41	Platform supports question database for management of test questions.	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y
42	Platform supports reporting features for test questions.	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y
43	Platform supports Microsoft Internet Explorer 4.x and newer browsers.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
44	Platform supports Netscape 4.x and newer browsers.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
45	Platform supports testing stage for courses to be debugged before making them live to students.	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
46	Platform allows author to view course as student without logging out.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
47	Platform has built-in threaded discussion list capabilities.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y
48	Platform has built-in chat capabilities.	Y	Y	N	Y	Y	Y	N	Y	Y	Y	N	Y
49	Platform can be integrated with Real Networks video and audio products.	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	?	Y
50	Platform can be integrated with Macromedia Shockwave products.	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	?	Y
51	Vendor provides development services.	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y
52	Management component will create reports for tracking student progress.	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y
53	Platform has feature to import existing test questions in a tab-delimited format.	N	Y	Y	N	N	Y	Y	Y	N	N	Y	N

Source. Modified from Hall (1999)

4.1.1 Observations

Administrative

The above comparison indicates that all the platforms allow the institutions to have sole ownership of the course content (Serial Number 2) and that they are focused on locally developed courses as opposed to ready-made courses (9).

The majority of the platforms do not provide advertisement for the courses (6). However Blackboard and WebCT contain internal search engines for the courses they host, to enable prospective learners to identify the courses of their desire. Lecando on the other hand promises to advertise the courses it hosts.

Another administrative issue to note is that, most of these platforms do not have large start-up costs except for Blackboard whose pricing is not based on the number of students registered for the course, but on the server configuration and the level of support provided for the client.

Institutional

This comparison indicates that customisation (Serial Number 11) and all current communication functions (12 and 13) are being provided on almost all the platforms. It is important to note the update in the case of WebCT with respect to synchronous communication features. While the reference comparison by Hall (1999) indicated that the company does not provide these features, this research has discovered that WebCT provides both chat and whiteboard facilities, which are used for real time communication. Another very important institutional feature indicated to be provide by almost all the platforms, except three including Lecando, is library resources other than the institution's holdings (Serial Number 20). Blackboard and WebCT provide additional library resources.

Only few of the Web based course management systems, including Lecando, do not provide an e-mail client on their platforms. The Lecando system however uses the feature "*Forum*" for internal messaging.

Developmental

It is indicated by the comparison that simple transfers to and from other platforms are possible with all except two of these systems (Serial Number 24 on Table 4.2). Also, on all the platforms, content can be authored and taken using PCs running Windows 95/98/NT and later versions (Serial Numbers 26 and 28).

Another issue of developmental concern examined is that of quality systems. Several of the systems, including Blackboard, WebCT and Lecando comply with the Instructional Management Systems (IMS) and Aviation Industry CBT Committee (AICC) quality systems (30 and 31).

4.2 Examination of Blackboard 5.0, WebCT 3.5 and Lecando learning platforms.

In examining the features of Blackboard 5.0, WebCT 3.x and Lecando Enterprise Server systems, emphasis is placed on the technological opportunities provided for distance learning on these Web based learning platforms. This is done with the aim of establishing, against the background of other offerings in the market, the strengths and weaknesses of the Lecando system, which system access has been secured by the World Maritime University generally for the purposes of evaluation of its Web education system. This research project in particular uses this Lecando access for developing a model of a Web based distance learning course using a test group of WMU staff and students.

The author acknowledges the wide references this research has made to the work of Siekmann (2001) in comparing WebCT 3.1 and Blackboard 5.0 but notes that, most of the opinions expressed by him in this particular comparison have been predicated on references to the Blackboard Website (Blackboard, 2001a), latest Blackboard 5 Release 5.5 (Yaksin & Gilfus, 2001), WebCT's Web site (WebCT, 2001a), WebCT 3.5 release (WebCT 2001b) and Lecando (2001b). E-mail contacts were also maintained with these companies for the clarification of issues of need (Gallagher, 2001). Information on the Lecando system was obtained from two Seminar presentations and one Orientation Workshop on how to use the Lecando system by a representative of the company, all at the World Maritime University. In addition, questionnaire responses were obtained from Lecando as well as personal, non-structured interview by the researcher.

4.2.1 Examination of features

Purpose

All three systems are designed to provide Web based course management services, especially to institutions for distance education programmes. These services generally include a user friendly tool for course content creation, organisation and presentation, asynchronous and synchronous communication facilities for participants, creation of interactive learning activities and computer corrected assessments of various forms, course and student management services, and e-campus community building where learning support is available. Despite this unity of purpose, the procedures and techniques are different between these systems. These differences in procedure and any inadequacies are discussed below, and the rating of the features of respective platforms, were attempted purely from the researcher's point of view.

4.2.1.1 Foundation architecture

The three Web based learning platforms are hosted on Java 2 Enterprise Edition (J2EE). The J2EE technology encompasses a servlet engine and an application server in the middle interacting with database on the back and a Web browser on the front. The courses may be hosted on the platform's server or on the institution's server connected to the platform's server.

4.2.1.2 Hardware and software requirements

A computer connected to a Java-enabled Internet server is a first requirement for an end-user in all the three systems. In addition, the end user requires a Web browser that enables a Java-enabled Internet server such as Netscape Communicator and Microsoft Internet Explorer. While WebCT specifies Netscape Navigator 4, Netscape Communicator 4.x, and Internet explorer 4+, and 5+, Lecando recommends Netscape Navigator 4.7 or later or Microsoft Internet Explorer 4.01 or later. Blackboard also recommends Netscape Communicator 4.x or Internet Explorer 5. The WMU uses Netscape 4.7, which is suitable to all the three systems.

The hardware requirement for institutions providing third party courses to participants vary, depending on the number of students/participants to be supported. As an example, the table of hardware requirements of Blackboard's clients is attached as **Appendix 2** to this dissertation.

4.2.1.3 Access requirement

All three systems operate a password protected online learning environment. The client or third party user requires a username and password to login to the system

4.2.1.4 Pricing

Both Blackboard and WebCT provide free evaluation courses but a licence needs to be purchased before student accounts are created. WebCT and Lecando prices are determined by the number of students and are calculated per year. The WebCT prices range from \$335 for up to 50 students (plus \$135 for faculty support) to \$4,000 for unlimited students (plus custom quote for faculty support). Lecando charges about \$1,400 for 20 students for a six-month evaluation of its system. Blackboard's pricing on the other hand is based on the category of server, course or portal manager and level of support. Prices range from \$5,000 per server per year for a level one system with basic support to \$60,000 per server per year for a level three system with elite support.

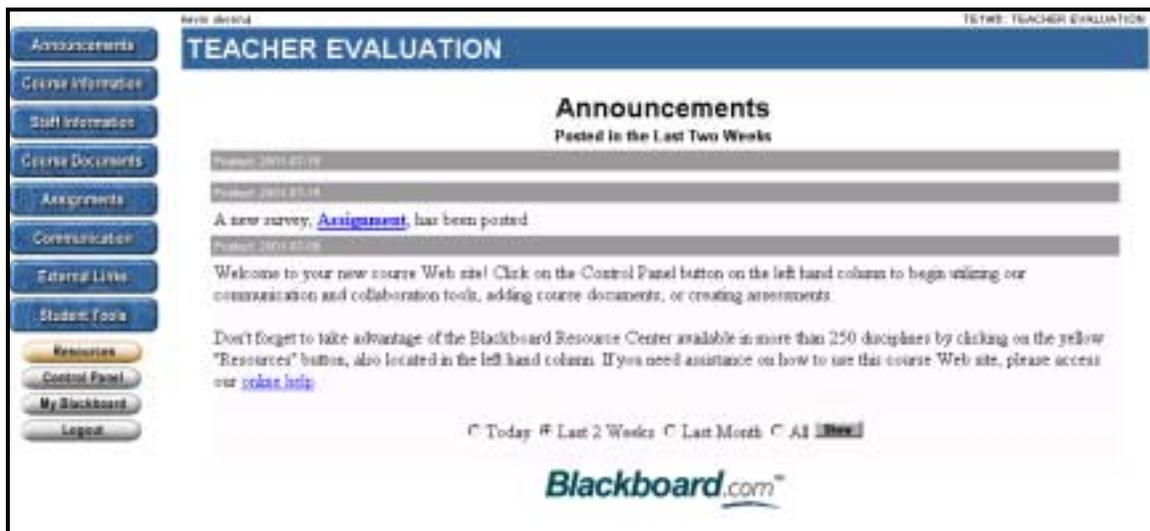
4.2.1.5 Customisation

In order to create an online course site, institutions, through their designers pick and choose from a variety of built-in course features, from content organisation, to communication tools, and to student homepages. This is the process of customisation, which helps to give the site the look and feel particular to the institution. The three systems, Blackboard, WebCT and Lecando, have generic templates or shell that the institution's course designers can customize. Template design is determined by the system administrator rather than by the individual course instructors. However, the instructors have a range of course features to customize.

The Blackboard system presents an effective and attractive opening page or homepage screen layout. It has the navigation buttons: *Announcement, Course Information, Staff*

Information, Course Documents, Assignments, Communication, External Links, Student Tools, Resources, Control Panel, My Blackboard, and Logout on the left serving as links to the relevant information: institution specific links at the top: and announcements on the remaining part of the screen. The Control Panel is used for creating the course materials and is not visible to the student (See Figure 4.1 below).

Figure 4.1: Blackboard's opening screen



Source: Blackboard.com

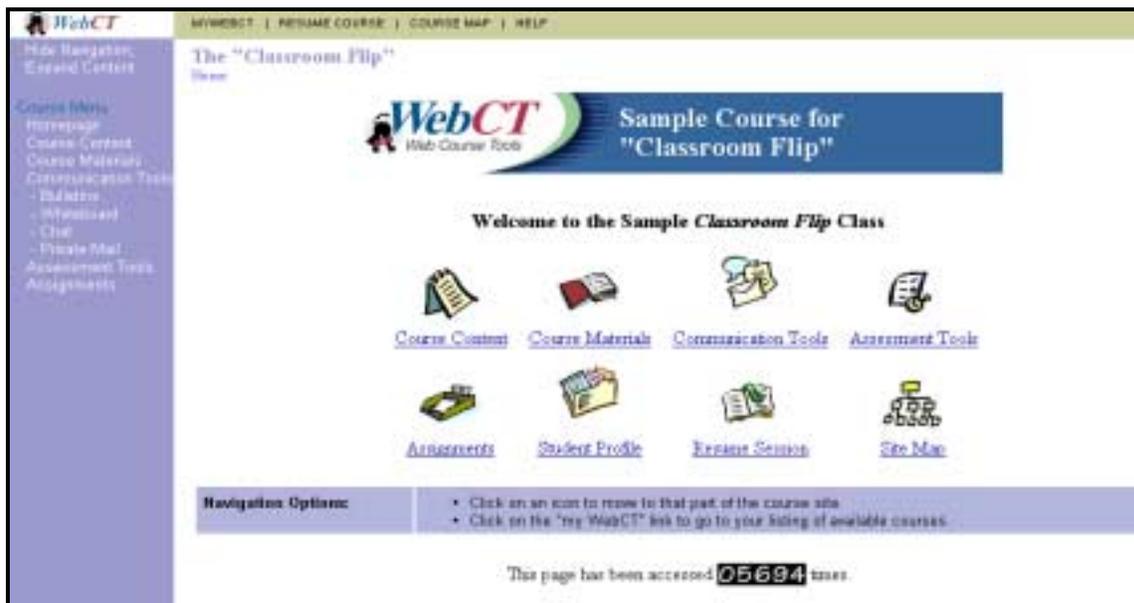
Blackboard provides tools that allow institutions to manage customisation at course, department, or institution level. The institution's designer of the opening screen can choose from a great variety of button styles in terms of shape, colour and patterns, but has only a limited set of choices for description text for the buttons which are all in English. For the design of the course shell, further limitations are introduced by Blackboard. For example, the number of button choices for the navigation buttons reduces to twelve and the icons used to designate the individual tools, such as the discussion board, e-mail, or student homepages cannot be changed.

WebCT similarly features a nice and effective homepage layout, which is divided into the navigation bar on the left, menu bar on top, and a main content area with icons.

The navigation bar is composed of the *Show/Hide Navigation* toggle, a *Control Panel*, and a *Course Menu* section consisting of *Homepage*; *Course Content*; *Course material*,

Communication tools, e.g. *Bulletins, Whiteboard, Chat, Private Mail*; Assessment tools, and *Assignment*. The menu bar contains links to *myWebCT, Resume Course, Course Map, Resources, Log-out, and Help*. The main content area is where the actual course material is displayed. An additional feature referred to as “breadcrumbs” lists the path of screens that a user has visited. The control panel provides central access to course creation and management functions. It is visible only to designers (See Figure 4.2).

Figure 4.2: WebCT’s Homepage

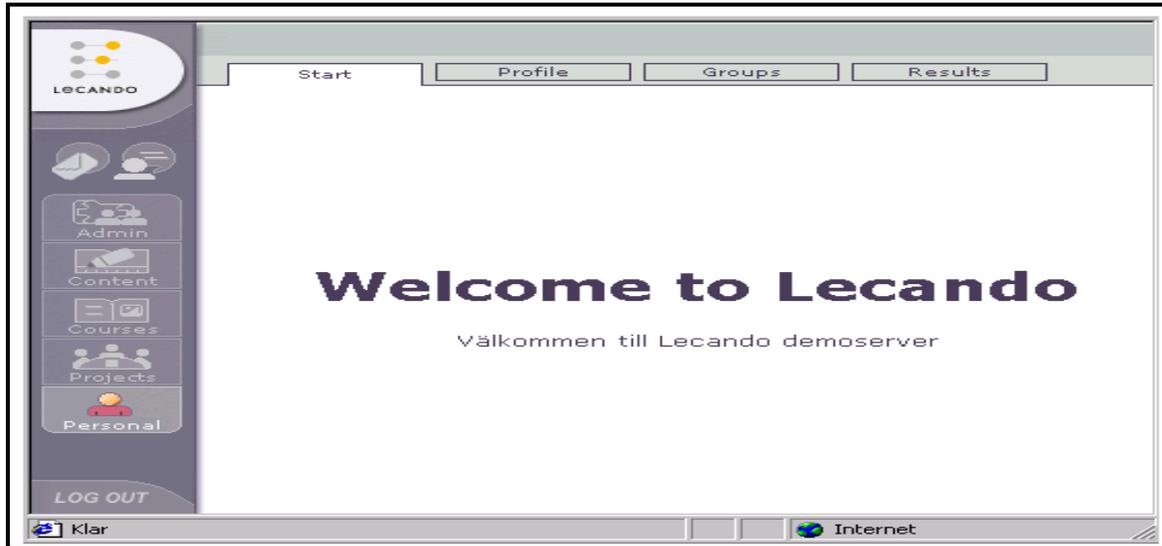


Source: WebCT.com

The WebCT system gives the designers a great variety of built-in icon styles to choose from, and even additional animated GIF icons can be imported into the environment. The background and font colours of WebCT can be customized individually or globally.

The Lecando system also presents a well-designed opening screen with the navigation links on the left, menu bar on top, and welcome and personal internal mail status on the remaining area of the screen. The navigation menu consists of *Admin, Content, Courses, Projects, and Personal links*. The *Admin* button is used as a link to features such as for creating new users and the *Content* button as a link to the environment for course creation. They are both not visible to the students. (See Figure 4.3)

Figure 4.3 Lecando Startpage



Source: Lecando.com

The content of the Lecando pages can be customized. For example, a choice can be made from three in-built language, British English, French and Swedish but, the Lecando clients have no direct privilege for changing the look of the site to reflect their individual conception. The Lecando design colours and text for the pages appear to be dull and most of the icons are highlighted only when pointed to or moved over with the cursor.

In summary, although Blackboard offers the most attractive interface, WebCT provides the widest options for customisation amongst the three systems.

Rating: Blackboard = 4.0; WebCT =4.5; Lecando =3.5

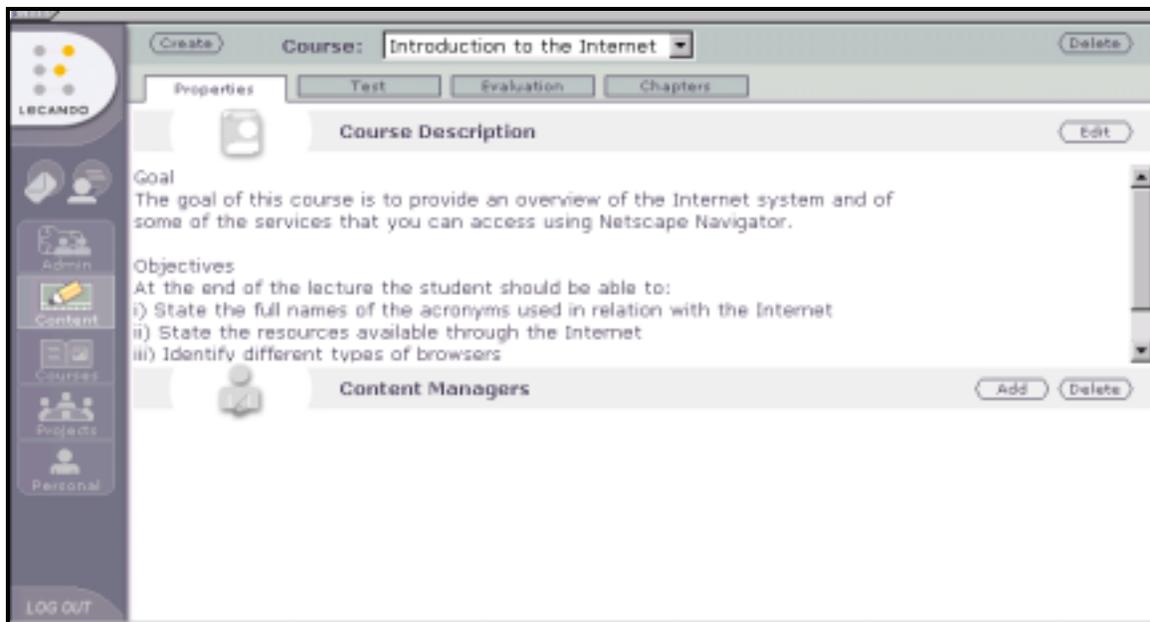
4.2.1.6 Course Content Organisation

The production of an effective Web based course involves the skills of technical communication. Markel (2001, p. 4) has indicated that producing technical communication involves creating, designing, and transmitting technical information so that people can understand it easily, effectively, and efficiently. An effective course content organisation should therefore lead to a concise communication that is clear and comprehensive.

Content in this case refers to the learning materials that are created and compiled by the instructor for the learners. This includes documents in html and various other files formats like PowerPoint (.ppt), word (.doc) and image (.jpg). However, in order to view non-html files in the three systems, users require the appropriate applications to be installed on their computers.

In the Lecando system, course content is organised into *course name*, *properties*, *test*, *evaluation*, and *chapters*. The chapters serve as folders for the files in varying file formats containing the content. The course creator can also view the course content under course menu as a student without logging out in addition to previewing it under content menu. Different file formats, apart from html, can be uploaded into the system, but the content that is created in Lecando is not made available to the students until published by the creator. The students can only access the course content under the *Course* menu, as the *Content* button is not visible to them (See Table 4.4 below).

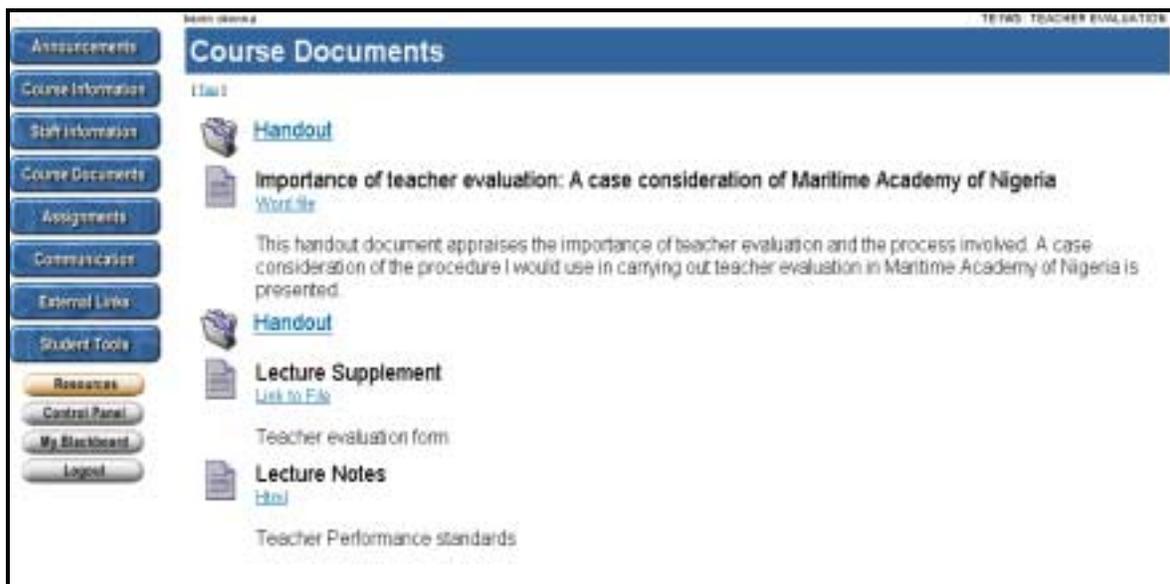
Figure 4.4: Course content display in Lecando system



Source: Lecando.com

The Blackboard system has three areas for the display of content. These are *course documents*, *course information*, and *assignments*. Each content area can contain several numbers of folders containing links to files of varying formats. Similar to the Lecando system, the instructor in Blackboard organises the material and presents only the links to the document in the content area. No interaction with the course material is possible in the content area unless the document's file is opened.

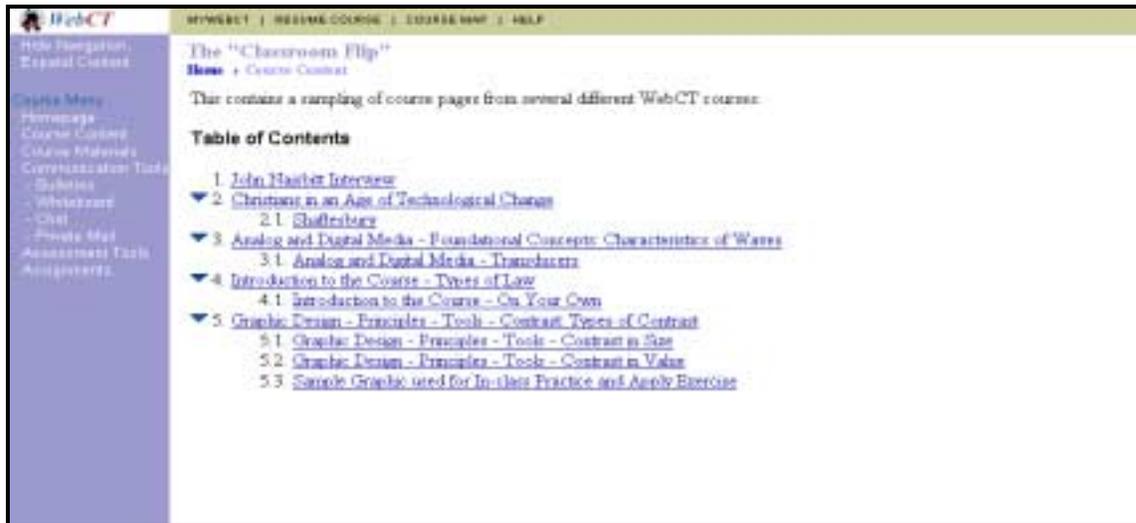
Figure 4.5: Course Document page in Blackboard



Source: Blackboard.com

In WebCT, the content is organised in modules, as headings in a hierarchical table of content, providing links to the files instead of chapters as in Lecando or folders as in Blackboard. Some unique features of WebCT include the facilities contained under the action menu. These include *self test* questions, which can be created for every page of the content; *glossary* for definition of words; *take notes* for taking notes during study; internal *search* engine for locating resources within the environment of the course; *chat*, *discussions* and *mail* for communication (See Figure 4.6 below).

Figure 4.6: Course Content in WebCT



Source: WebCT.com

A very important feature in Blackboard and WebCT is that content in html file format is displayed on the screen with the platforms' navigation links retained on the screen. The browser's (e.g. Netscape) menu bar icons are also retained while the student is interacting with content in html file format. The advantage of this provision is that with one click these links and activities can be established. In Lecando, on the other hand, the files, irrespective of the format, open in a different window that covers the navigation buttons and the browser's menu bar icons. Consequently, any need for these links demands the closing of the content window first. However, in all three systems, other file formats as well as communication tools are opened in a separate window that covers the screen. The Blackboard and Lecando systems provide facilities for establishing external link to, for example, Web resources, as part of the course materials.

In summary, Lecando organises content in chapters, Blackboard organises in folders and WebCT organises in modules. Content organisations in the three systems are pedagogically easy to use, and can be uploaded in many other file formats other than html. The Lecando chapter format appears to be a more formal system, but Blackboard and WebCT present the easier access links while the student is in the course environment.

Rating: Blackboard =4.0; WebCT =4.0; Lecando =3.5

4.2.1.7 Communication tools

The three systems contain both asynchronous and real-time or synchronous communication facilities. The asynchronous tools in both Blackboard and WebCT are e-mail and discussion board. The discussion board allows the learner to create topic areas for discussion. It can be used for both public and private asynchronous communication. Although the functions of the discussion board in both systems are the same, they present different interfaces. There are two features in Lecando that have the functions of global bulletin board, the *project* and *course period*. The *project* is a feature in Lecando used for sharing files and having a common forum for discussions. Both private and public forums can be set up within the *project area*. The private forum could be for discussions between a participant and the instructor only. To access everybody in the system, the *course period* can also be created that everybody in the system belongs to. Files may be attached to mails generated within the *project* or *course period areas*.

E-mail tools in both Blackboard and WebCT are different. Blackboard offers external e-mail to users and they have to supply the address unless the platform is serving an institution that supplies automatic e-mail accounts to students. WebCT, on the other hand, offers only internal e-mail and generates automatic addresses for students when they sign into the system. This means that students have to access the system before sending e-mails to course mates. Although it is possible to forward message to an external e-mail, it is not possible to respond to a forwarded mail from outside of WebCT. In the Lecando platform the tool used for communication between course participants and the instructor is referred to as *forum*. Through this facility a student can read messages from other students and also deliver their own message. The *forum* in Lecando therefore serves as an internal e-mail tool. Through the *project area*, the *forum* can be created for public or private use.

All the three systems also contain real-time or synchronous communication facilities. These include, the chat, whiteboard, and digital dropbox facilities. The chat tool consist of chat rooms and is used for real time written communication while the whiteboard is used for real time visual communication. The whiteboard has an area for drawing and colouring figures of different shapes. The Blackboard system combines the chat and

whiteboard tools into one sophisticated tool, the virtual classroom, and gives the instructor control over turn taking. The virtual classroom incorporates PowerPoint slides presentation by combining the visuals with real time text-based chat. The instructor can also give control over the drawing area of the whiteboard to the student. The Lecando system combines the chat and whiteboard facilities into one window and it is possible to switch between the whiteboard and chat sessions. The digital dropbox is used in the three systems for file transfers, for example, the submission of assignment, which automatically indicates the status as such for the instructor.

Rating: Blackboard =4.5; WebCT =4.0; Lecando =4.0

4.2.1.8 Collaboration tools

Collaborative learning is an instructional method that requires students to work together on academic tasks. This normally involves a wide range of co-operative activities requiring active peer involvement and participation using shared resources, and results. Duffy, Dueber and Hawley (1998, p. 58) argue that working with other people in the inquiry process is considerably different from individual inquiry and that those differences must be taken into consideration in the design of electronic support system, especially in a learner-centred environment.

The communication tools described above generally contribute to collaboration as they are used for consultation and cooperation in the exchange of resources amongst participants. But all three systems have established specific areas on their platforms for use in interactive activities between peers participating in knowledge construction. These activities include task-oriented small group work, discussion of topics, student presentation, debate, questions and peer assistance, and student homepages.

In the Lecando system, the tool designed mainly for task-oriented collaborative activities between course participants is the *project* mentioned under communication tools above. Anybody in Lecando can create an own project area for sharing files and having a common forum where nobody else has access unless invited. A forum of members of the particular 'project' has to be established for communication between the members. The file quota per *project* in Lecando today is set at 50MB.

Siekmann (2001, p. 606) has argued that, especially in distance education settings, participants' individual homepages can help create better understanding amongst the participants and foster esprit de corps. All three systems have built-in tools for students to create individual homepages with biographical data, photograph and addresses. In both Blackboard and WebCT the student can also create personal links within the pages, and each member of the class can access these pages. Continuous update of pages is also possible. The presentation area is used for such activities as PowerPoint presentation and presentation of relevant course Web site links. It is important to note that in the process of collaboration students might need to use more than one tool in their group work. The bulletin board might be used in the formulation of the scope and focus of the topic, while the chat and whiteboard are used for articulating the discussion results, and the student presentation area is used for presenting the outcome of their discussions to other members of the class.

In summary, the Blackboard system offers a unique *communication centre* that incorporates several communication tools including, the Virtual Classroom (chat and whiteboard), discussion board, e-mail, and file exchange tools. The *project area*, which can incorporate the 'forum', whiteboard and chat, is the main collaboration tool in Lecando, but file exchange in WebCT is only possible through e-mail or *discussion*.

All the three systems, Blackboard, WebCT and Lecando contain tools for collaboration, but Blackboard presents the best combination of tools.

Rating: Blackboard =4.5; WebCT =3.5; Lecando =4.0

4.2.1.9 Assessment

The assessment tool is one aspect of Web based learning that has drawn criticism from the public on the competence of Web based management systems. One line of argument has been the inability of the system to allow for assessment of higher order knowledge through essay type questions. During a recent seminar on Information Technology in Shipping, dealing with educational aspects, at the WMU, another area of concern was raised concerning the security of the assessment process.

However, great innovations are being devised by the management systems to surmount these perceived inadequacies. Although the systems have not yet developed a method for automated marking of essay type questions, the setting of such questions for instructors' manual marking is possible. Automated marking techniques have been developed for other assessment question types available in these environments including quizzes, multiple choice questions, calculations, and short answer questions.

The Blackboard system offers a step-by-step process to create quizzes, surveys or assignment, multiple choice, multiple correct, true/false, matching, ordering, fill in the blank space and essay type questions. It is possible to include multimedia or other attachments with questions, import prepared test banks from external sources, randomise and re-use questions from question pools, provide password-protected tests, timed tests, and instant feedback to students, schedule and automate the release and recall of assessments by date and time allowing for sequential release, and create statistical reports of student answers.

In addition to containing tools to allow for the step-by-step creating of all the question types aforementioned in this section, the WebCT system also allows the creation of student self-test questions to help the students to gauge their understanding as they proceed through the course. As with Blackboard, paragraph questions have to be corrected by the instructor and answers to short answer questions, though possible to mark automatically by making case sensitive and then pattern matching, have to be cross-checked by the instructor. To increase online security, WebCT assessment can be made available, based on computer IP addresses in addition to password protection. This measure is to constrain examinees to taking their examination on their particular connected computer.

The Lecando system also has a step-by-step procedure for setting assessment test using any of the following question types: multiple choice, multiple answers, exact match, and essay. The questions can also be randomised into a pool for repeated use.

Generally, all three systems contain tools for determining the number of attempts the student should be allowed in the test, and students can review their grade in the online grade book which is only automatically generated on marking in Lecando, without the

possibility to delay the release. The Blackboard and WebCT systems contain a very important tool for quality standards of academic institutions. That is the facility that allows the scheduling and automation of the release and recall of assessments by date and time allowing for sequential release of results. This can then afford the institutions the opportunity for the validation of examination questions and results for quality standards before release to the students. The assessments of collaborative exercises, such as student presentation, project or debate, in the three systems are effected by the instructor either by being part of the exercise or viewing the recorded version of such activities.

Rating: Blackboard =4.0; WebCT =4.5; Lecando =3.5

4.2.1.10 Course and student management tools

Course and student management tools have been described in the previous chapter as including facilities for tracking students' use of course content, participation in group activities, student progress reports in online grade books, creating and managing course statistics. Apart from being a feature that distinguishes Web based management systems from mere Web pages design, it is one that gives Web based distance education advantage over traditional education management when properly designed, in such capabilities like tracking students' study involvement.

The use of online grade book in all three systems has been treated in the immediate previous section. In addition, it should be noted that the Lecando system allows the student's grade to be automatically generated on marking using a predetermined grading formula and the information is downloadable. Although the instructor can access the results of all the students, individual students can only access their own results. Both Blackboard's *online grade book* and WebCT's *assessment tools* automatically record students' quiz scores, tabulate statistics, conduct item analysis, and make information downloadable. Both software systems also record the number of attempts the students made in each question, and the students can access their standing with respect to other students in the class.

Of the three systems, only Blackboard and WebCT provide student tracking feature, but in different ways. The Blackboard system tracks usage either by user, date, day of the

week or time of the day, or combination of these, and shows percentage of overall usage of each area of the course. The WebCT on the other hand, provides tracking by first and last access and number of hits for each of the areas of the course. The number of original bulletin board messages and responses is also recorded. Both systems also offer page, file or folder usage tracking.

Another very important course management feature found in the three systems is the ability for sequential release of the course content to the students. The Lecando system does not make course content available to the students until published by the instructor. Using this tool therefore, the instructor can create the entire course but manually release the content in scheduled times. In the Blackboard system, individual files or folders can be manually made available or unavailable as the instructor desires. The WebCT has, however, introduced some level of automation into these features. It allows the conditional release of any of the icons or content modules but not individual files by using filters such as date, time, student name, quiz score or other student management factors. As an example, the availability of the next module might be dependent on the student's grade in the current module.

In summary, the three systems contain student and course management tools, but the provision of student tracking tools set WebCT and Blackboard far above the Lecando system.

Rating: Blackboard =4.5; WebCT =4.5; Lecando =3.5

4.2.1.11 Multimedia applications

The ability to incorporate multimedia facilities such as sound files and video files in Web based distance learning is necessary for higher-level collaboration.

Both Blackboard and WebCT can incorporate multimedia into their systems but the usability depends more on the software capability available to the instructor and the student. Both software systems require additional plug-ins such as RealPlayer, QuickTime Player, and Windows Media Player to access multimedia files. Both software systems also have the capability to interface with a CD-ROM to play large multimedia files instead of facing the problems of slow modem connections and narrow bandwidth

associated with multimedia applications. Only WebCT offers any special settings for multimedia use. This is only sound editing.

In the Lecando system, although the multimedia software application, Marratech, has been indicated in the system for incorporation into the *project* and *course periods*, the installation has not yet been effected. The company promises to activate the feature in the very near future (Lecando presentation at Information Technology in Shipping Workshop and Orientation Workshops on the use of the Lecando platform at the WMU).

Rating: Blackboard =3.0; WebCT =3.0; Lecando =2.0

However, the incorporation of multimedia and hypermedia features into Web based distance learning has higher transmission cost implications. Broadband transmission and installation of appropriate software on learner computer are prerequisites for this level of collaboration. For example, in a Netmeeting demonstration of video conferencing, using Marratech software, in an Information Technology in Education class at the World Maritime University, it was revealed that the 100Mbits per second transmission capacity of the World Maritime University Internet lines does not yield the best possible results in the transmission of picture and sound. While the video picture was not of high resolution, the sound production was intermittently disrupted. This points to the requirement for higher transmission capacity, in the region of fibre optics capabilities up to the terminals, for excellent results, which of course costs more.

4.2.1.12 Language application

The Lecando system has been designed to operate in any of three languages, English, French, and Swedish. Both WebCT and Lecando provide no support for foreign languages. The use of foreign language in these two later systems depends more on external computer settings and software available to the student and instructor.

Rating: Blackboard =2.0; WebCT =2.0; Lecando =4.0

4.2.1.13 Ease of use

In reviewing the ease of use of these systems, care was taken not to jeopardise sophistication with ease of use of the system. Rather, the management of sophisticated design in effective course content organization played a significant role in the perception of the ease of use of these three systems. The Lecando, Blackboard, and WebCT systems deserve their individual merits for system design effort, but have considerably different content organizational structures as have been analysed in the previous section under course content organisation. Siekmann (2001, p. 613) has mentioned that in the University of South Florida, they conduct a one day Blackboard workshop, but two days WebCT workshops for their staff. In view of all the considerations, this research would be inclined to rate these systems as below.

Rating: Blackboard =4.0; WebCT =3.5; Lecando =3.5

4.2.1.14 Social environment and learning support

The constructivism theory of education which, principles have been identified by this research as crucial for knowledge construction in an online environment may be divided into two basic areas of emphasis. These are cognitive constructivism and social constructivism. While cognitive constructivism focuses on individual construction of knowledge discovered in interaction with environment, social construction derives more from Vygotsky's socio-cultural theory of cognitive development which, promotes the social context of student learning (Bonk & Cunningham, 1998, p. 32; Vygotsky, 1978). Social constructivists view learning as being connected with an appropriation from the socio-cultural context within which the learners exist.

The various communication tools and interactive activities when utilized properly in an online learning environment present a form of social context where learning occurs. This is because through communication, understanding and collaboration develop. In this context, all three systems, WebCT, Blackboard, and Lecando provide a social environment on their platforms. In addition to this general setting, some systems design other facilities to widen the social context under which knowledge construction is undertaken in their environments. For example, the individual student's homepage, with

biographical data, can be accessed by each other in the course in both WebCT, Lecando and Blackboard systems. This enables the students to get to know each other better.

On a wider scale however, both WebCT and Blackboard systems provide unique community areas that incorporate learning support. The Blackboard's *online communities* provide an environment where members can engage in stimulating and thought-provoking conversations. The communities offer members the ability to discuss topics within the various academic and professional fields with Blackboard users from around the world. The communities are also integrated with the new *resource centre* and *instructor centre*, where users can read feature articles for discussion in the Communities. The WebCT hosts e-learning communities in a variety of academic disciplines. Each e-learning community provides instructors and students with expertise and resources. For example, course content can be found by searching or browsing through the communities' libraries that contains an ever-growing collection of information, including images, videos, CD-ROMS, simulation exercises, glossaries, and other reference material.

Rating: Blackboard =4.0; WebCT =4.0; Lecando =3.5

Table 4.3: Summary of WebCT, Blackboard, and Lecando features

WebCT	Blackboard	Lecando
	Communication	
Discussion (threaded, asynchronous) Mail (internal, asynchronous) Chat (synchronous, text only) Whiteboard (synchronous, primarily visual, but text possible) Assignments/Dropbox (file exchange) Calendar	Discussion board (threaded, asynchronous) E-mail (external, asynchronous) Virtual Classroom (synchronous, text, and images) Digital dropbox (file exchange) Calendar	Forum in project and course period areas (threaded, asynchronous) Chat (synchronous, text only) Whiteboard (synchronous, visual but can be interchanged easily with chat) Digital dropbox (file exchange)
	Course Content	
Unlimited number of content modules <ul style="list-style-type: none"> • Student annotations • Glossary • Learning goals • References • Audio (independent of WebCT) • Video (independent of WebCT) • Self-test questions • Search • Links to communication tools Image database	Three content areas (organised in folders and files) Sequential release of content Multimedia applications (dependent on external software capabilities) Links to communication tools	The course is organised in chapters, and the files in the chapters Multimedia (audio, video-soon to be installed) Links to external resources possible Multiple tutor for individual chapters
	Exercises and Assessment	
Self-test (not reported to instructor) Multiple choice or true/false only Quizzes (full reports and statistics for instructor)	Quizzes (full reports and statistics for instructor) Survey (anonymous) Question types <ul style="list-style-type: none"> • Multiple choice/multiple answer 	Question types <ul style="list-style-type: none"> • Multiple choice • Matching type • Short answer question • Essay type

Table 4.3 continued.

WebCT	Blackboard	Lecando
<p>Surveys (anonymous)</p> <p>Question types</p> <ul style="list-style-type: none"> • Multiple choice (one or more correct answers) • Short answer (fill in the blank with pearl matching) • Matching • Paragraph (instructor corrected) • Calculated <p>Settings</p> <ul style="list-style-type: none"> • Randomisation • Conditional release based on time, name, IP address, prior quiz score, variable scoring of questions and quizzes • Variable release of scores <p>Student homepages</p> <p>Student presentations</p>	<ul style="list-style-type: none"> • Short answer (fill in the blank) • Matching • Paragraph (instructor corrected) • Ordering <p>Settings</p> <ul style="list-style-type: none"> • Randomisation <p>Import prepared test banks from external sources</p> <p>Include multimedia or other attachments with questions</p> <p>Variable release of scores</p> <p>Student homepages</p> <p>Student presentations</p> <p>Student areas</p>	<p>Results automatically made available to students and instructor</p> <p>Randomisation</p> <p>Incorporation of image in questions</p>
	Course and Student Management	
<p>MyWebCT</p> <p>Manage students</p> <ul style="list-style-type: none"> • Automated score transfer • Downloadable scores <p>Track students/pages</p> <p>My progress (student progress report)</p> <p>My Record (student grade report)</p>	<p>MyBlackboard/my institution</p> <p>On-line grade book</p> <p>Automated score transfer (downloadable)</p> <p>Course statistics</p> <p>Scheduled, automated, sequential release of assessments by date and time</p>	<p>Online grade book</p> <p>Automated score transfer (downloadable)</p>

Table 4.3 continued

WebCT	Blackboard	Lecando
	Social Environment/Learning Support	
Asynchronous/synchronous communication facilities WebCT	Asynchronous/synchronous communication facilities Blackboard	Asynchronous/synchronous Internal communication facility (forum)
Student homepages e-learning communities (in variety of academic disciplines) expertise resources to instructors and students communities' libraries (large collection of information)	Student homepages Online communities Thought provoking conversations Links to Blackboard users around the world Integration with Resource Centre and Instructor Centre Articles for discussion Libraries.	Student homepages

4.2.2 Summary of ratings

This summary of ratings is only a reflection of the researcher's perception considering the facts available to him and does not in any way represent absolutes for these companies. The aim has been to show numerically a perception of the strengths and weaknesses of these systems with the view to the outcomes being of developmental assistance, where necessary, to the companies.

The rating has been performed on a scale of 1 to 5, where 1 represents low strength or weakness and 5 represents high strength.

Table 4.4: Summary of Ratings

	Blackboard	WebCT	Lecando
Customisation	4.0	4.5	3.5
Course Content Organisation	4.0	4.0	3.5
Communication Tools	4.5	4.0	4.0
Collaboration	4.5	3.5	4.0
Assessment Tools	4.0	4.5	3.5
Course and Student Management	4.5	4.5	3.5
Multimedia Applications	3.0	3.0	2.0
Language Applications	2.0	2.0	4.0
Ease of Use	4.0	3.5	3.5
Social Environment/Learning Support	4.0	4.0	3.0
Average	3.85	3.75	3.45

The researcher recognises that individual evaluation items may represent varying values for different clients, and that different features may be given prominence in varying circumstances. The averages have been computed to reflect a 'global' picture. The use of this research result therefore depends more on the desires of the user with respect to the expected outcomes of the use of any of these platforms for distance education purposes.

4.3 Development trends in Web based distance education management

In the foregoing Chapter this research has shown that there are many commercial providers of online learning platforms. However, as the patronage for this form of education is spreading at a fast rate, governments, international organisations and agencies and academic institutions are becoming involved in the provision of this learning platform in order to derive the best benefit and consequently provide the best bargain in terms of cost and ownership rights for the increasing number of clients.

The Massachusetts Institute of Technology (MIT), through its Open Knowledge Initiative, in partnership with Stanford University, is creating a Web based environment for online education resources. The programme is being designed to improve on the lowest common denominator of client's needs that commercial e-learning systems are designed to support. Accordingly the partnership is developing tools that are sustainable, open source, support teaching and learning through collaboration and work together with other campus systems. The initiative is expected to be useful to institutions that are interested in retaining the full control of their online distance education systems. Anybody will be able to extend the system by adding new features or tools (MIT, 2001). Also, the International Telecommunication Union (ITU) established the Global Telecommunication University and Global Telecommunication Training Institute (GTU/GTTI) in 1998 whose training programmes are based mainly on online distance education methods and media (Zaragoza, 2001). Nuthal (2001) has also indicated that the ITU in collaboration with the Maltese government is planning to establish an Internet University in Malta. The University is aimed at spreading information and communication technology especially to developing countries, and will be coordinated by the Global Telecommunication University and the Global Telecommunication Training Institute. The foregoing indicates the involvement of every sector of the society in Web based distance education systems.

Chapter 5

Working model of a Web based course

Introduction

This chapter builds on the ideas developed in the previous chapters including the concepts of distance learning but particularly the requirements of an appropriate online learning environment and the evaluation of Web based course management systems.

The chapter is sub-divided into three sections. In the first section issues concerning the administration of an online course are considered. In the second section the relevant criteria in the design of a model Web based course are analysed. The last section presents the parameters used in the design of the model course on the Lecando Web based course management system for trial operations using a test group of WMU staff and students.

5.1 Administrative issues

It has been noted in previous sections of this dissertation that technology is the medium for completing instructions in any distance education programme. Therefore, the first decision to take in planning for the execution of distance education is about the appropriate technology to use. As an example, this research is limited to the use of Web based technologies for delivering distance education.

Once the decision on technology is made, the implementation of a functional distance education system involves several administrative and organisational components. Williams (2000, p. 14) has identified these organisational components to include:

- a) statements of mission, purpose and objectives;
- b) unified programme, curricula, teaching, and learning strategies;
- c) well-developed interdepartmental infrastructure, communication, and interaction;
- d) the presence of administrative proponents;
- e) policies regarding students, tutors, and proctors;
- f) engaging additional staff and outside experts as needed;
- g) materials development; and
- h) disbursement, reimbursement, and evaluation.

Kirkwood (2000, p. 256) narrows down the required decision levels to two: that is strategic decisions and tactical decisions.

5.1.1 Strategic decisions

At the first level, strategic decisions need to be taken by senior management concerning the determination of the courses to run and the student population that is appropriate and feasible for launching the course using the identified technologies. As an example, Garrison (2000, p. 208) points out that one component of the Florida Gulf Coast University's mission was to try to deliver distance courses to 25% of the students enrolled at the university.

The management of the ownership of intellectual property rights is another serious issue requiring policy decisions. Schmidt (2000) indicates that some professors worry about the issue of intellectual property rights and points out that, a question such as,

“Will the university offer a class once the professor has been fired, retired, left for another institution, or died?” (p. 87).

is common within online academic arena. In contribution to this issue, Horton (2000, p. 94) indicates that despite the common misconception that if something is on the Web,

then it is free for taking, copyright is granted to the creator of a work the moment it is “fixed in a tangible medium”. Schmidt (2000, p. 87) therefore adds that issues concerning intellectual property rights should be clarified through intellectual property contracts that will guarantee the rights of all parties. That is, professors who develop original text for courses need to copyright them and the university or other course developers will then need permission, and user rights for future use.

However, the American Association of University Professors suggests an amicable notion of “joint works” for resolving contentions over intellectual property rights between the universities and faculty members whose works are transferred to the Internet. This notion provides that if faculty members are placing work on the university Web sites, by the university mandate, and using university tools to do so, then the university is entitled to part ownership of that Intellectual property (The National Law Journal, 2001).

5.1.2 Tactical decisions

Tactical decisions are taken at the second level. This is mostly the function of the line managers than of the senior managers. Such decisions concern the appropriateness of the technology for the intended population. Sufficiency of the access to the technology by the target population and its cost are important considerations to be taken account of at this stage. The back up delivery media in case of uncertainties arising from the selected technology should also be decided at this level.

The decision on what type of learner support to provide for the students in the development of the (new) skills associated with using the media, such as the Web, for education has to be made.

5.1.3 Team approach

The World Wide Web allows a teacher easily to adapt materials created for lecture or classroom use and present them as attractive colour graphics and text through what

Bates (1997, p. 104) calls “lone ranger” approach. It is evident that many online courses lack the basic design consideration and that the Web is most times used as a medium for the delivery of instruction created within another framework (Carr-Chellman & Duchastel, 2000, p. 229). Although the intellectual capability of such lecture materials might not be disputed, it is the design incompatibility with the transmission medium that makes them less valuable in the Web environment. In fact Carr-Chellman and Duchastel (2000, p. 231) identify a current shift in paradigm from the traditional concept of “delivery of instruction at a distance” to “learning without distance” with Web based education. They argue that the term “delivery system” should be banned in Web based learning with emphasis on such terms as “organise instructions” and “create learning materials” in its place.

This new paradigm calls for making available learning resources and instructional activities to students. This holds true wherever the students are (probably within the campus, down the street, or in another continent) and whenever the students need the resources.

The task of making learning resources and instructional activities in the ideal format that upholds continuous quality standards is a specialist job, and most universities have departments associated with online education or distance education divisions. These departments have the very important task of following rigorous design guidelines and assuring that all online offerings are of high quality (Carr-Chellman & Duchastel, 2000, p. 233).

In line with the above arguments, Bates (1997, p. 104) also argues that there are critical roles within the development and delivery of new technologies for distance education that require the role of project management. Considering the failure rates of most “lone ranger” technology-based courses, and the need for the cost effectiveness of such programmes, he suggests a team approach to their administration. Such a team requires the services of a project manager, an instructional designer, an Internet system

administrator and other necessary support staff to ensure better product quality, and the opportunity for revenue generation.

5.2 Critical design elements for a web based course

Combining the views of Ellsworth (1994, p. 435), Oliver (1999, p. 243), Carr-Chellman and Duchastel (2000, p. 232), and Bohannon (2001) this research summarises the critical design element for an online course to include:

- a) Instructional and audience analysis
- b) Course goals and objectives
- c) Course content
- d) Learning (instructional) activities
- e) Learner support
- f) Evaluation.

5.2.1 Instructional and audience analyses

Formal or informal instructional and audience analyses should be conducted prior to the onset of a course design.

Instructional analysis should determine the suitability of a course for online delivery with present technology capability and determine areas of knowledge and skills involved in achieving instructional goals.

Audience analysis should determine the learner's personal characteristics, intellectual skills, subject knowledge level, and purpose of taking the course. It should also include the learner's technology skills and previous experiences with online courses.

5.2.2 Course goals and objectives

Course learning goals and objectives should be stated in a manner that is clear and measurable. They should be publicly available and explicitly communicated to the learner (Bohannon, 2001, p. 3).

5.2.3 Course content

The content for an online course has been identified by Siekmann (2001, p. 596) as comprising any materials created by the instructor that are to be made available to student, including reading passages, PowerPoint presentations, multimedia files, etc. In a constructive learning environment however, the total content that a learner is exposed to does not have to be generated by the instructor. Collaborative processes, such as through small group work, problem solving, debates, and response to student-posed questions generate very good content enrichment. Oliver (1999, p. 243) suggests that what is required is for learners to be exposed to content that provides them with perspectives from a multitude of sources. Authentic examples and contexts are very valuable elements. The context in which content has been considered for effective online learning is therefore one in which it serves as a resource for learning rather than the focus of learning.

5.2.4 Learning (instructional) activities

Learning activities determine how the learners will engage with the course materials and the forms of knowledge construction that will take place. Specific instructional activities should be directed toward providing learners with the necessary skills, knowledge, and experience required to meet the goals and objectives of the course (Bohannon, 2001, p. 3). A reading exercise, with material either created by the teacher or recommended, or listening to a lecture delivery in real-time or asynchronously constitute different learning activities.

However, in order to ensure knowledge construction in an online environment, one critical factor is the sustenance of motivation in the learner to continue to act independently. Appropriately selected learning activities can ensure the retention of the motivation of the learner to continue to collaborate in the learning process in order to yield the expected learning outcomes. The collaborative processes mentioned above, including small group work, problem solving, and debates are all types of learning activities. One way to provide the motivation for learners to participate in these content enrichment and knowledge construction activities is for the instructor to include assessment credits. For example, awarding assessment credit for every problem solved and for a predetermined quantity of relevant materials posted for sharing with others.

5.2.5 Learning Support

Learning support, which has been critically analysed in this dissertation in Chapter 4 and includes academic support, library support, counselling and peer collaboration, constitutes another very important element in the design of an online course.

5.2.6 Evaluation

Methods and procedures for formative and summative course evaluation should be carefully planned in the course design process. Formative evaluation can be in the form of learner assessments, communication with students, and periodic evaluations given to students. Summative evaluation includes analysis of formative assessments, student examinations, surveys, and interviews with students. Effective Web based management systems contain facilities for management of evaluation processes.

Methods and procedures for evaluating student learning must be directly linked to stated learner objectives.

5.3 Model Web based course design and trial operations

5.3.1 Principles

This model course design is based on the pedagogical principles for a Web based course discussed so far in this research. In particular, the course upholds the student centred approach, constructivist learning principles and the required collaborative and interactive activities. Content in this course model is considered to serve as a resource for learning rather than the focus of learning.

5.3.2 The Platform

The Lecando Web based management system, one of the three systems evaluated in Chapter 4, was used as the platform for the course design on the basis of an existing contract with the company providing temporary access to the World Maritime University for evaluation purposes of the software.

5.3.3 Critical elements

a) Instructional and audience analysis

Audience

The audience for this course was designed to consist of 15 participants from the WMU comprising of students and 3 staff members. However, only ten took active participation.

Method of selection of audience

An e-mail message (attached as **Appendix 4**) was sent to all the WMU Class of 2001 students and staff groups requesting volunteers for participation in the trial operations of the working model course. Before this request, questionnaires were administered to all the staff and the Class of 2001 students of the World Maritime University for the purposes of determining their level of familiarity with Web based technology for educational purposes.

b) Course Properties

Topic: Introduction to the Internet.

Course goal

The goal of this course is to provide an overview of the Internet system and of some of the services that can be accessed using Netscape Navigator

Course objectives

At the end of the lecture the student should be able to:

- i) State the full names of the acronyms used in relation to the Internet
- ii) State the resources available through the Internet
- iii) Identify different types of browsers
- iv) State the requirements for Internet access on land and at sea.
- v) Analyse the Internet penetration into different continents of the World.

c) Course content

The Lecando Web based system organises course content into *properties* - for the description of the course goals and objectives as described above, *chapters* - for uploading files containing the course learning materials, *assignment, test, result, and evaluation*. The following were uploaded for these different aspects of course content.

Chapters

Chapter 1: Introduction. This is a PowerPoint document of outlines on introduction to the Internet.

Chapter 2: Resources. This is a word document containing additional Web resources to enable the students to expand their information search and also for it to function as a guide for participating in the collaboration exercise.

Assignment

The assignment for this course was aimed at fostering interaction and collaboration amongst the participants for knowledge construction. The generation of more content by the learners for the course was also targeted. The text of the assignment as constructed by the researcher is as follows.

“Using the Web sites supplied in this course, choose a colleague from the list of students and compare the level of penetration of the Internet into your countries or continent(s). Use the netchat facility of this system.”

Test

The Lecando system uses the digital dropbox for files exchange between participants, through which tests, assignments and evaluations are automatically sent to the instructor as the student finishes and saves his/her work.

The test was set to measure the student’s achievements of the stated learning objectives. The text of the test questions is presented as **Appendix 5** to this dissertation. Participants’ test results are presented on Table 6.6.

d) Learning activities

This course was designed to take advantage of all the communication facilities on the Lecando Web education platform. For this purpose, the assignment was meant to make the students use the *forum* facility in the system, which is equivalent in function to the public bulletin board, for posting topics for discussion amongst the participants.

The forum for discussion can also be set up either in a private or public *project* area. The participants were therefore encouraged to set up their own *project areas* as well as use the netchat and whiteboard facilities of the system.

The researcher set up the “Internet Group” which connected all the participants to the “Course Period” and ensures a common forum for group communication. The interaction and collaboration that ensued generated other useful content to the course.

In recognition of the adopted student centred approach, the participants were allowed to discuss the course content, and were only provided general guide were necessary. The generated discussion pattern is attached to this dissertation as **Appendix 6**.

e) Learning Support

To provide guidance to the participants on how to use the system, the researcher organised individual orientation sessions for each of the participants. In addition prompt responses were made available to the participants on request.

Peer collaboration was encouraged by setting an exercise for discussion and providing Web resources to form the basis of commencement of the exercise. Guided academic input was made to the discussions as well as providing counselling on the benefit to be derived on full and active participation in the course exercises.

f) Evaluation

Evaluation responses are anonymous in the Lecando system, which is an advantage. The text of the evaluation question as constructed by the researcher is presented below.

“Briefly express your opinion about the use of this environment (Web based education management system) as a medium of learning.”

Excerpts of the course evaluation comments are analysed in 6.3.2 of Chapter 6.

Duration of the course

The duration of the course was one week, during which participants were given access to the Lecando system.

In the following Chapter the data that have been generated in this research, including those referred to in this chapter as appendices are analysed.

Chapter 6

Data collection and analysis

Introduction

In the course of this research, primary data, including questionnaire responses, Web based course management systems evaluation results, trial operation results, and secondary data, including research and other publications were collected and used for the studies. In this chapter the methods employed in data collection and the analyses of these data for the following specific activities are presented:

- i) Measurement of the opinions of WMU staff and students toward a Web-based distance learning programme for the WMU (using questionnaires)
- ii) Examination of some Web based distance education management systems
- iii) Trial operations with a model Web based course.

6.1 Questionnaire data analysis

6.1.1 Sampling method

Questionnaire data were obtained from three of the five sample groups of the WMU-related population considered in this research using purposive sampling method (please refer to Research Methodology). These three sample groups include:

- i) WMU students (Class of 2001)
- ii) WMU entire staff (excepting cleaning and reception staff)
- iii) WMU non-resident lecturing staff.

6.1.2 Questionnaires construction

The questionnaires used for collecting data from these sample groups were designed to use summated rating (Likert type) scale to measure the opinion (the construct) of both WMU students and staff about Web based distance learning management system for the World Maritime University (WMU).

The procedure taken for the construction of the questionnaires were as follows.

a) Items formulation

Based on the theoretical conceptions of Web based distance learning management systems, the researcher assembled a large number of (questionnaire) items that are relevant to these conceptions. Only monotone items, which are those that are clearly favourable or unfavourable, were used.

b) Pilot study

In carrying out the pilot survey, the researcher was guided by Jude, Smith, and Kidder (1991, p. 164) who argue that there is a strong interplay among the theoretical conceptions of the construct to be measured, the process of writing items to reflect the theoretically expected dimensions, and the analysis of the data from pilot subjects to verify the presence of the pattern. The pilot questionnaire items were first administered and discussed with some of the researcher's course mates in the Maritime Education and Training (MET) Class of 2001 in the WMU.

A simple approach was used in the items analyses. Items whose responses did not indicate high strength in measuring the desired construct, that is the opinion of the subjects, were discarded. The resulting questionnaire items were then discussed with the research supervisor to incorporate staff opinion, and further amendments were effected to produce the final copies of the questionnaires for staff and students.

The resulting questionnaires used the Likert scale with a five-point measuring scale coded as presented below:

Strongly Agree (SA):	+2
Agree (A):	+1
Neutral (N):	0
Disagree (D):	-1
Strongly Disagree (SD):	-2

Samples of these questionnaires are attached as appendices as described below:

Appendix 7: Research Questionnaire (for staff).

Appendix 8: Research Questionnaire (for students).

6.1.3 Data collection method

The staff questionnaire was distributed to some staff personally and to others through their mail boxes in the WMU. For anonymity staff were advised (as stated in the introduction to the questionnaire) to return their completed questionnaires to the MET Faculty Assistant.

The researcher and the respective class representatives distributed the student questionnaire. The students were advised to return the questionnaire either through their class representatives or to a box outside the researcher's room at the student hostel.

6.1.4 Questionnaire data analysis

In the analysis of the data, positive (+) and negative (-) signs were introduced to indicate the direction in which each item is worded.

For example, a negative rating score would be recorded for a disagreement with a negatively worded item of measurement. The combination of these two signs is a positive, which indicates a positive opinion towards Web based distance learning management system for the WMU. On the other hand, a positive rating score would be recorded for an agreement with a negatively worded item of measurement. The combination of these two signs is a negative, which holds a negative opinion about Web based distance learning management system for the WMU.

This mathematical procedure ensures that the sign combination of each score retains the opinion of the responder about the object of interest.

a) Staff questionnaire analysis

Of the 45 copies of staff questionnaire distributed, 24 were returned, 12 from lecturing staff and 12 from administrative staff, representing 53%. The analyses below are categorised into these two classes.

Also, eleven (11) of the fifteen (15) questionnaires distributed to non-resident lecturing staff were responded to, representing a 73% response.

Note: The opinion of the staff supervisor for this research was not included in this analysis

i) Lecturing staff

Table 6.1: Lecturing staff responses to questionnaire

S/No.	Item	SA	A	N	D	SD
1	There is more demand for WMU training than can be met on campus (+).	4	6	1	1	
2	WMU has the appropriate technology to support Web based distance learning programme (+).	2	2	5	3	
3	WMU's Web based distance learning programme will afford vital education and training to many maritime industry personnel who cannot come to the campus (+).	2	8	2		
4	I have easy access to the Internet in my office (+).	12				
5	I have easy and inexpensive access to the Internet in my home (+).	5	5		2	
6	I am comfortable with browsing through the Internet (+).	5	6	1		
7	I have experience in Web based distance learning programmes (+).		3	3	3	3
8	If WMU commences Web based distance education, I would be willing to attend Web based course development workshops (+).	3	5	4		
9	Web based learning technologies offer opportunities for increased learning activities for the learner (+).	2	9	1		
10	Web based learning technologies can improve course content and motivation for learning (+).	1	6	5		
11	Web based distance learning will extend the time frame for lecturer-student interaction (+).	1	3	7	1	
Totals of ratings for positively constructed items		37	53	34	10	3
12	As a lecturer, I am concerned about the loss of my intellectual property rights through participation in Web based distance education (-).			5	7	
Totals of ratings for negatively constructed item		0	0	5	7	0

Note: (+) represents positively worded items in favour of the Web based distance learning management system, and
 (-) represents negatively worded items not in favour of the system.

Rating values.

Strongly Agree	(+2)
Agree	(+1)
Neutral	(0)
Disagree	(-1)
Strongly Disagree	(-2)

Total positive opinion score (P).

Σ SA (+): sum of all Strongly Agree to positively worded items = 37

Σ SD (-): sum of all Strongly Disagree to negatively worded items = 0

$[\Sigma$ SA (+) + Σ SD (-)] = 37

$[\Sigma$ SA (+) + Σ SD (-)] x (+2) = 37 x 2 = +74

Σ A (+): sum of all Agree to positively worded items = 53

Σ D (-): sum of all Disagree to negatively worded items = 7

$[\Sigma$ A (+) + Σ D (-)] = 60

$[\Sigma$ A (+) + Σ D (-)] x (+1) = 60 x (+1) = +60

Total positive attitude score (P) = 74 + 60 = +134

Total neutral opinion score = 36

Total negative opinion score (N).

Σ SA (-): sum of all Strongly Agree to negatively worded items = 0

Σ SD (+): sum of all Strongly Disagree to positively worded items = 3

$$\sum SA (-) + \sum SD (+) = 3$$

$$[\sum SA (-) + \sum SD (+)] \times (-2) = 3 \times (-2) = -6$$

$$\sum A (-): \text{sum of all Agree to negatively worded items} = 0$$

$$\sum D (+): \text{sum of all Disagree to positively worded items} = +10$$

$$\sum A (-) + \sum D (+) = +10$$

$$[\sum A (-) + \sum D (+)] \times (-1) = +10 \times (-1) = -10$$

$$\text{Total negative opinion score (B)} = -6 - 16 = -22$$

$$\text{The scale score} = (|P| - |N|) \div (\text{Number of lecturers} \times \text{Number items})$$

(Where $|P|$ and $|N|$ represent the absolute values of P and N)

$$= 112 \div (12 \times 12)$$

$$= 0.78$$

Interpretation

The scale score of 0.78 represents the measure of the aggregate opinion of the lecturing staff of the WMU on a five-point scale between Strongly Agree (+2) and Strongly Disagree (-2) about Web based distance learning management system for the WMU. This is a positive value indicating an agreement with some reservations.

Item 3 on Table 6.1 reveals that 10 of the 12 lecturers who responded agree that, WMU's distance learning programme will afford vital education and training to many maritime industry personnel while the remaining 2 are neutral. Item 9 reveals also that 11 of the lecturing staff agree that Web based learning technologies offer opportunities for increased learning activities for the learner, without any disagreement. However, only 3 of the 12 lecturers indicate any experience on Web based distance learning programme (item 7), but 8 lecturers would be willing to attend Web based course development workshops (item 8).

ii) Administrative staff

Table 6.2: Administrative staff responses to questionnaire

S/No.	Item	SA	A	N	D	SD
1	There is more demand for WMU training than can be met on campus.	2	7	1	2	
2	WMU has the appropriate technology to support Web based distance learning programme.		3		7	2
3	WMU's Web based distance learning programme will afford vital education and training to many maritime industry personnel who cannot come to the campus.	5	2	5		
4	I have easy access to the Internet in my office.	12				
5	I have easy and inexpensive access to the Internet in my home	5	4		2	1
6	I am comfortable with browsing through the Internet.	9	3			
7	I have experience in Web based distance learning programmes		1	2	5	4
8	If WMU commences Web based distance education, I would be willing to attend Web based course development workshops.	2	4	2	2	
9	Web based learning technologies offer opportunities for increased learning activities for the learner	5	5	2		
10	Web based learning technologies can improve course content and motivation for learning	4	3	3	1	1
11	Web based distance learning will extend the time frame for lecturer-student interaction	2	2	4	3	1
Total ratings for positively constructed items		46	34	21	22	9
12	As a lecturer, I am concerned about the loss of my intellectual property rights through participation in Web based distance education			10		1
Total ratings for negatively constructed item		0	0	10	0	1

Total positive opinion score (P).

$$\sum SA (+) = 46$$

$$\sum SD (-) = 1$$

$$[\sum SA (+) + \sum SD (-)] = 47$$

$$[\sum SA (+) + \sum SD (-)] \times (+2) = 94$$

$$\sum A (+) = 34$$

$$\sum D (-) = 0$$

$$[\sum A (+) + \sum D (-)] = 34$$

$$[\sum A (+) + \sum D (-)] \times (+1) = 34$$

$$\text{Total positive opinion score (P)} = 94 + 34 = 128$$

Total neutral opinion score = 32

Total negative opinion score (N).

$$\sum SA (-) = 0$$

$$\sum SD (+) = 9$$

$$\sum SA (-) + \sum SD (+) = 9$$

$$[\sum SA (-) + \sum SD (+)] \times (-2) = -18$$

$$\sum A (-) = 0$$

$$\sum D (+) = 22$$

$$\sum A (-) + \sum D (+) = 22$$

$$[\sum A (-) + \sum D (+)] \times (-1) = -22$$

$$\text{Total negative opinion score (N)} = -40$$

The scale score = $(|P| - |N|) \div (\text{Number of Administrative staff} \times \text{number of items})$.

$$= (128 - 40) \div (12 \times 12)$$

$$= 88 \div 144$$

$$= 0.61$$

Interpretation

The scale score of 0.61 represents the measure of the aggregate opinion of the administrative staff of the WMU on a five-point scale between Strongly Agree (+2) and Strongly Disagree (-2) about a Web based distance learning management system for the WMU. This is a positive opinion but less than a complete “Yes”. It is noted here that the administrative staff have a less positive opinion than the lecturing staff’s 0.78.

Table 6.2, item 3 reveals that 7 of the 12 administrative staff believe that Web based distance learning management system will afford vital education and training to maritime industry personnel while 5 remain neutral. Ten of the 12 administrative staff agree that Web based learning technologies offer opportunities for increased learning activities for the learner (item 9). However, only 1 of the 12 administrative staff claims any experience in Web based distance learning (item 7), 2 of these staff would not be willing to attend a Web based course development workshop (item 8), while 9 disagree that WMU has the technology to support a Web based distance learning management system (item 2).

With regard to the last item (2) it is important to note that all the staff strongly agrees to having an easy and inexpensive access to the Internet in their offices (item 4) and the high majority also have in their homes (item 5). This is the foundation of Web based course management technology.

iii) Non-resident lecturing staff

Table 6.3: Non-resident lecturing staff responses to questionnaire

S/No.	Item	SA	A	N	D	SD
1	There is more demand for WMU training than can be met on campus.	1	8	2		
2	WMU has the appropriate technology to support Web based distance learning programme.		5	7		
3	WMU's Web based distance learning programme will afford vital education and training to many maritime industry personnel who cannot come to the campus.	3	7	1		
4	I have easy access to the Internet in my office.	10	1			
5	I have easy and inexpensive access to the Internet in my home	4	7			
6	I am comfortable with browsing through the Internet.	5	3	3		
7	I have experience in Web based distance learning programmes	1	3	2	4	1
8	If WMU commences Web based distance education, I would be willing to attend Web based course development workshops.	2	5	3	1	
9	Web based learning technologies offer opportunities for increased learning activities for the learner	1	10			
10	Web based learning technologies can improve course content and motivation for learning	1	5	4	1	
11	Web based distance learning will extend the time frame for lecturer-student interaction	1	5	5		
Totals of ratings for positively constructed items		29	59	27	6	1
12	As a lecturer, I am concerned about the loss of my intellectual property rights through participation in Web based distance education	1		4	6	
Totals of ratings for negatively constructed item		1		4	6	

Total positive opinion score (P).

$$\sum SA (+) = 29$$

$$\sum SD (-) = 0$$

$$[\sum SA (+) + \sum SD (-)] = 29$$

$$[\sum SA (+) + \sum SD (-)] \times (+2) = 58$$

$$\sum A (+) = 59$$

$$\sum D (-) = 6$$

$$[\sum A (+) + \sum D (-)] = 65$$

$$[\sum A (+) + \sum D (-)] \times (+1) = 65$$

$$\text{Total positive opinion score (P)} = 58 + 65 = 123$$

Total neutral opinion score = 31

Total negative opinion score (N).

$$\sum SA (-) = 1$$

$$\sum SD (+) = 1$$

$$\sum SA (-) + \sum SD (+) = 2$$

$$[\sum SA (-) + \sum SD (+)] \times (-2) = -4$$

$$\sum A (-) = 0$$

$$\sum D (+) = 6$$

$$\sum A (-) + \sum D (+) = 6$$

$$[\sum A (-) + \sum D (+)] \times (-1) = -6$$

$$\text{Total negative opinion score (N)} = -10$$

The scale score = $(|P| - |N|) \div (\text{No. of non-resident lecturing staff} \times \text{number of items})$.

$$= (123 - 10) \div (11 \times 12)$$

$$= 113 \div 132$$

$$= 0.86$$

Interpretation

The scale score of 0.86 represents the measure of the opinion of non-resident lecturing staff of the WMU on a five-point scale between Strongly Agree (+2) and Strongly Disagree (-2) about Web based distance learning management system for the WMU. This is a positive opinion less than a full “Agree (+1)” but stronger than the resident lecturing and administrative staff.

It is important to also note that 4 of these 11 responding staff indicate having experience in a Web based distance learning programme while 5 indicate lack of experience. Seven of the staff indicate the willingness to attend Web based distance course development workshops.

b) Student questionnaire analysis

Thirty-five (35) of the eighty (80) questionnaires distributed to WMU Class of 2001 students were returned, representing a 44% response.

Table 6.4: Student responses to questionnaire

S/No.	Item	SA	A	N	D	SD
1	There is more demand for WMU training than can be met on campus.	9	16	8	2	
2	WMU has the appropriate technology to support Web based distance learning programme.	2	18	13	2	
3	WMU's Web based distance learning programme will afford vital education and training to many maritime industry personnel who cannot come to the campus.	7	21	4	3	
4	I like browsing through the Internet.	12	19	4		
5	I have undertaken a Web based distance-learning course before.	1		7	14	13
6	Web based distance learning technologies can increase the variety of learning activities available for the student.	8	20	5	1	1
7	I will be happy to undertake upgrading/refresher training courses after graduation, through the WMU's Web based distance learning programme.	12	16	4	1	2
8	I would be willing to undertake online supported elective course/module here in the WMU.	7	12	10	2	4
9	With the available technology, Web based distance learning presents increased communication links between teacher and student.	7	13	7	6	2
10	Web based distance learning will improve my study time flexibility.	4	21	6	3	1
11	I have easy an inexpensive access to the Internet at my home in my country.	3	12	4	10	6
12	I have easy access to the Internet in WMU.	24	8	3		
13	Pre-arrival training on the Web would enhance the performance of new students.	11	20	4		
Totals of ratings for positively constructed items.		107	196	89	44	29

Total positive opinion score (P)

$$\sum SA (+) = 107$$

$$\sum SD (-) = 0$$

$$[\sum SA (+) + \sum SD (-)] = 107$$

$$[\sum SA (+) + \sum SD (-)] \times +2 = 214$$

$$\sum A (+) = 196$$

$$\sum D (-) = 0$$

$$[\sum A (+) + \sum D (-)] = 196$$

$$[\sum A (+) + \sum D (-)] \times (+1) = 196$$

$$\text{Total positive opinion score (P)} = 214 + 196 = 410$$

Total neutral opinion score = 89

Total negative opinion score (N).

$$\sum SA (-) = 0$$

$$\sum SD (+) = 29$$

$$\sum SA (-) + \sum SD (+) = 29$$

$$[\sum SA (-) + \sum SD (+)] \times (-2) = -58$$

$$\sum A (-) = 0$$

$$\sum D (+) = 44$$

$$\sum A (-) + \sum D (+) = 44$$

$$[\sum A (-) + \sum D (+)] \times (-1) = -44$$

Total negative opinion score (N) = -106

The scale score = $(|P| - |N|) \div (\text{Number of students} \times \text{number of items})$.

$$= (410 - 106) \div (35 \times 13)$$

$$= 304 \div 455$$

$$= 0.67$$

Interpretation

The scale score of 0.67 represents the measure of the aggregate opinion of the sample of the WMU students on a five-point scale between Strongly Agree (+2) and Strongly Disagree (-2) about Web based distance learning management system for the WMU. This indicates a positive opinion with concerns.

Item 6, reveals that 28 of the 35 students who responded believe that Web based distance learning can increase the variety of learning activities for the students while only 2 disagree. Twenty-six (26) of the students will be happy to undertake upgrading/refresher training courses after graduation, through the WMU's Web based distance education programme while three disagree (item 7). Generally, the highly positive opinion of the students is evident with other items. However, about half of the students indicate lack of easy and inexpensive access to the Internet in their homes (item 11), while only 1 indicates any experience with Web based distance learning programme.

c) Correlation of scores

It is important to note the correlation in the scale scores of the sampled subject groups: 0.78 for lecturing staff; 0.61 for administrative staff; 0.86 for non-resident lecturing staff; and 0.67 for the students. The test for the reliability of the instrument used and the measurement as indicated by Guildford and Frutcher (1978, p. 87) is therefore satisfied.

d) Summary of preferences for Web based learning technologies by sample groups

The following table shows the summary of the subject groups' preferences for modern technologies applied to Web based distance learning.

Total number of lecturing staff:	12
Total number of academic staff:	12
Total number of non-resident staff:	11
Total number of students:	35
Total number of subjects:	70

Table 6.5: Summary of preferences for Web based learning tools

Technology	No. of Lecturing staff	No. of Admin. Staff	No. of Non-resident Staff	No. of students	% of total sample group
E-mail	9	11	8	23	73
Online library	11	9	8	18	66
Net-chat	4	4	5	9	31
Internet Explorer's net meeting	2	3	0	13	24
Teleconferencing	4	2	3	5	20
Video conferencing	4	7	4	15	43
Electronic whiteboard	4	4	7	5	29
Other Internet software systems (suggested by the subjects).					
Web based course management systems	1				
Search Engines				1	

The low percentages of preference for the learning technologies other e-mail and online library is explained by the low level of acquaintance with these tools for learning by the subjects. This table indicates that a higher percentage of staff prefer using e-mail and online library for learning than the students.

e) Summary of concerns raised by the subjects in additional comments

Staff

In the analyses of the concerns raised by the staff of the WMU about a Web based distance learning management system for the university, a merger of interests and common opinion were identified. These concerns are listed below with excerpts of some of the comments presented under them.

- i) Required time intensiveness for the development of course materials for Web education:

“...The Web is powerful, but it takes time and effort to prepare material: it is not just a question of copying lecture notes onto Web pages.”
- ii) Requirement of competent personnel and financial implications:

“Web-based courses are popular as well, but they are time intensive to create and many universities have found it expensive to provide the large support staff that is typically necessary to assist faculty in putting up such a course.”

“ Web based learning is an integral part of education these days – we cannot escape it. Producing the educational packages, however, needs personnel who are qualified and experienced in distance learning and producing such material. The university would have to get such personnel.”
- iii) Problem of access to the Internet in developing countries constituting the main focus of WMU’s training:

“In the context of WMU students, their diverse background and geographical disposition, a large proportion of student population (ex-student and prospective ones) may not be in a position to use the distance learning techniques.”

- iv) Equality of credits for courses offered both in conventional classroom and on the Web:

“The issue of equality is central because when credit is given for a course given via the Web, the implication is that the courses are not just the same, but identical in their impact on the knowledge base of the student.”

- v) Intellectual property rights:

“ I am not concerned about it but there are some faculty that consider their approach to education as being in the realm of their ‘creative property’ and therefore want incremental compensation for placing it more in the public domain than it is when they are simply in the classroom.”

Students

The comments raised by the students expresses more concern for the lack of access to the Internet in the developing countries from where the majority of WMU students should be drawn. The students, however, agree that WMU’s Web based distance learning programme would benefit the international maritime industry immensely if the programme is established. Excerpts of some of the additional comments made by the students are presented below:

“ Web based distance learning is a useful technology which will inevitably be applied to the maritime industry. If WMU develops such a system, the maritime industry would benefit much from it. At the same time WMU itself will also enhance its own influence on the industry.”

“In developing countries we have not enough or adequate facilities to support Web based distance learning. It is expensive and unreliable. Another problem is the balance between family matters and work. Web based distance learning will be an additional load.... Consider also electronic fraud...”

“Internet is still in its primary stage in most developing countries and will not meet WMU’s mission of support and training to developing countries.”

6.2 Analysis of data from examination of Web based distance education management systems

In chapter 4, data were collected for two purposes:

- i) Comparison of Web based distance education systems (4.1)
- ii) Examination of Blackboard, WebCT, and Lecando systems (4.1).

The sources of the data used for the examination and comparisons included research publications, questionnaire data obtained from Lecando AB (**Appendix 3**), operational manuals, tutorials, and product overview documents of the systems (referenced in the respective areas), and the researcher’s personal evaluation of the Lecando, WebCT and the Blackboard systems on the Web.

The comparison of Web based learning management systems made an overview of 12 systems, while the examination of the Blackboard, WebCT and Lecando systems also led to the comparison of these three systems. The summary of the ratings for the comparison of Blackboard, WebCT, and Lecando and the analysis are presented in Section 4.2.2 of Chapter 4.

6.3 Analysis of data from trial operations results

In Chapter 5 the Lecando Web based course management system was used as a platform for designing a working model of a Web based distance education course for trial operations. The model Web based course used the student centred approach that emphasises collaboration amongst the participants using the technological tools available in the environment. Consequently, the participants were encouraged to participate in the discussion of the topic of the course using the *forum* (equivalent of

global bulletin board) for interaction. The discussion pattern generated in the course is attached to this dissertation as **Appendix 6**

For confidentiality sake the names of the participants in the evaluation of the Lecando Web based course management system, which includes both staff and students of the WMU) are not displayed against the test results of the participants presented here.

Table 6.6: Working Model Course Test Results

Participants	Test score (%)
1	100
2	80
3	80
4	80
5	80
6	90
7	80
8	70
9	70
10	80

The high marks scored by the participants in this trial operation indicate the effectiveness of the system as a medium of learning.

6.3.1 Evaluation results

The working model course evaluation reports expressed an overall agreement with the effectiveness of the Web as a medium for learning but raised concerns about some issues. Some of the strong concerns raised have been described below as limitations.

6.3.2 Limitations

- i) Web based learning system does not give the tutor the opportunity to employ his/her communicating skills in conveying information to the students.
- ii) It is possible for the participant doing a test to open multiple windows, one containing the questions and the other the learning materials, to cheat in the test process.
- iii) There is the requirement for the incorporation of multimedia tools such as video and audio to raise the level of collaboration.
- iv) It is tiring to learn for a long time through the computer.
- v) The inability of all the students to be online at the same time is an impediment to quick reference to a colleague for assistance during studies.
- vi) There is no guarantee on the quality of the information on the Web to be used reliably as a resource base for academic purposes.
- vii) Solution to test questions cannot be released immediately to students on completion of the test, as this would invalidate the examination process.

In this chapter, the relevant data for the determination of WMU's needs in a Web based distance learning management system obtained in this research have been analysed and interpreted. The summary of opinion of staff and students is in support of the establishment of a Web based distance learning management system for the WMU, but also raised concerns about low level of access to the Internet in the developing countries as well as instructional and administrative implications. The findings of the researcher's investigations into the critical elements of a Web based learning environment and the evaluation of some Web based course management systems in Chapters 3 and 4, respectively, have also been referred to. Also, the results of the trial operations with a working model of a Web based course using a test group of WMU staff and students were reported. These data will then be used in the last Chapter 7 to draw conclusions on the needs of the WMU in Web based distance learning management system.

Chapter 7

Conclusions and Recommendations

Introduction

In this chapter the research draws conclusions on the investigations that have been undertaken in the preceding chapters and ends with recommendations as to the potential use of Web based distance learning management system for WMU's purposes.

7.1 Conclusions

To be able to draw purposeful conclusions on this research, the purpose for the research is used as the basis for making judgements.

In Chapter 2 this research has identified the evolving emphasis on Web based learning and instructional techniques in higher educational institutions including traditional universities of equivalent status to the WMU. The hitherto very exclusive and elite conventional universities have been driven by demands for life long learning opportunities, flexibility in learning time and place, and the globalisation movement in higher education into embracing Web based technologies for global oriented educational purposes. But the rapid rate in the evolution of information, communication and networking technologies, opening up new opportunities for educational application is always leaving the academia with opportunities to desire to acquire, and perhaps the pedagogical implications of the new technologies to debate about.

Considering the small size of the WMU in terms of financial base and infrastructure, an effective Web based distance learning management system is crucial for achieving certain desirable strategic goals of the university. These include raising student enrolment, strengthening industry linkage, enhancing academic standards and credibility through research and development and consultancy. This research has accordingly identified the following as potential areas of activities for the use of Web based distance learning for programme outreach in the WMU:

- i) Professional development courses in maritime specialisations
- ii) International maritime research and development project coordination
- iii) Distributed system of on-campus learning with some part of courses offered online to introduce flexibility in student-lecturer interaction.
- iv) Upgrading and refresher training courses for WMU alumni.
- v) Pre-arrival training of WMU new students

The critical components of Web based distance learning environment have been identified and critically analysed in Chapter 3. In the evaluation of the following specific Web based course management systems, Blackboard, WebCT, and Lecando systems, this research has come to the conclusion that the three systems have the potential to be used through the WMU network offering a wide range of technological features to enable the design of learning opportunities including, course content organisation tools, communication, collaboration, assessment, and course and student management tools, multimedia applications (excepting Lecando) and facilities for creating social environment and learning support. The WebCT and Blackboard systems were found to contain facilities for sequential release of assessment results allowing for assessment validation exercise. The Blackboard system was however found to provide the widest learning opportunities although the requirement of a particular course might still lead to the choice of any of the other systems for specific purposes.

For higher-level collaboration in line with the constructivism theory of education being favoured for online learning, multimedia applications are required in course activities. This raises the issue of the need for broadband transmission using optic fibre lines with streaming video capabilities for the university's entire intranet and Internet networks. The current 100mbps line capabilities are therefore not sufficient for this purpose.

The Open Knowledge Initiative of the Massachusetts Institute of Technology (MIT) has been noted in Chapter 4 to promise an open source platform for online distance education management by academic institutions.

The working model of a Web based course was developed on the Lecando Web based course management system. The trial operations indicated the effectiveness of the system as a learning environment but also identified limitations with such a system in general. These limitations, which have been listed in Section 6.3.2 of Chapter 6 include using the multiple windows capabilities of Internet browsers to cheat in the test process.

This research project has come to its conclusion with the full acknowledgement of the fact that Web based learning technologies though very powerful is a fairly new concept which therefore attracts the expected, and in fact, productive criticisms from academics on a wide range of involving issues. The researcher must therefore express the encouragement received from the sampled groups of the WMU community in their contributions to the research, expressed as an aggregate positive opinion about Web based distance learning management system for the WMU. The concerns raised about the possible negative impact of the low level of Internet access in developing countries on the potential use of this education system by the developing population group as well as course design and personnel implications have been integrated into the recommendations presented in the next section.

7.2 Recommendations

Having determined the scope for the possible future use of Web based distance learning management system for programme outreach for the WMU, identified the critical components for learning using this environment and also identified the limitations that exist through the practical evaluation of such systems, this research deems it necessary to make the following recommendations taking into consideration the opinion and concerns of the student and staff members of the WMU.

1. The WMU should consider using the medium of Web based distance learning for programme outreach to achieve a particular percentage of students from the developed world. In view of the current declining interest of this developed population in seafaring, the following subject areas may prove more feasible.

- i) Professional development courses in maritime specialisations
- ii) Joint international maritime research and development.

These should lead to raising the student enrolment, enhancing academic standards and research, and providing higher global profile for the university.

2. The WMU's online learning management system should serve as a network hub for providing distance education to the industry and coordinating the cooperation between the several maritime academies in the world and recognised providers of distance education in maritime education and training. Such a role should ensure the quality of educational materials being packaged for distribution for maritime education and training, be it packaged computer based training (CBT) products or simulation programmes and facilities advice.
3. In view of the concerns raised by WMU staff and students about the potential negative impact of low Internet access in the developing world, the use of this learning system for pre-arrival training of new WMU students and in the upgrading and refresher training of WMU graduates should be delayed until the above recommended projects in No. 2 and No. 3 are well founded.

4. The WMU's network transmission capacity and speed should be increased to optic fibre capabilities up to the terminals to accommodate multimedia and other high volume data transmission activities in course development before the commencement of the Web based distance learning programme.
5. The Web based course management system that will be used by the WMU for distance learning should be the one that the student cannot open multiple windows when in the test-taking environment in order to avoid the examination malpractice noted in Section 6.3.2 (ii) of Chapter 6. It is also important that the system incorporates the facility that allows the scheduling and automation of the release and recall of assessment by date and time for the validation of quality standards of examination questions and results before releasing to the students.
6. This research recommends the establishment of a specialist unit consisting of experienced personnel in Web based course development and distance learning management in the WMU before launching a distance learning programme. Such a team could be made up of a project manager, instructional designer, Internet systems administrator, and the necessary support staff.
7. Before the programme is launched the consent of WMU's funding organs must be obtained through a well-articulated cost benefit analysis of the intended courses to be run.
8. To overcome the resistance of most staff members to participating in this technology based development, an intensive personnel training on the involvement of this programme and the methods for achieving the roles of every one involved should be organised.
9. A further research should be carried out to determine the size of the prospective participants in the professional development courses and upgrading/refresher training courses before launching the programme.

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