Information Technology and Distance Learning: Keys to global IAMU-MET collaboration

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ABSTRACT

The paper examines global developments in distance learning methods and in computer and Information Technology systems, and considers the role they could be playing in a changing MET environment in the future.

What opportunities might CBT and global connectivity bring to MET and how can MET institutions become more closely involved in the future needs of both the onboard and shore based MET environment? The author reports on a comprehensive global survey of 90 MET institutions, finalised in 2001, which sought feedback on current and future use of new teaching technology and methodologies, and discusses the issues raised by such findings.

Planned developments by the World Maritime University for future outreach to the global community via the Internet/World Wide Web, built on the excellent computing and information technology facilities now in place at WMU are described and commented upon.

The paper concludes by examining several questions. Can we create a collaborative Web-based MET centre for access by any mariner at sea or student ashore? How might distance learning methods and online connections be used to help create a communications environment to enhance this approach? How might IAMU use such technology to develop a collaborative role in global MET?

1.Introduction

In the 21st century, the maritime education and training community finds itself facing an explosion of new developments in communication tools, simulation, software training programs and expanding use of computers linked to the Internet and the Web. Computers and computing are the catalyst behind many changes affecting maritime industry operations. The modern ship today is a floating computer centre, increasingly provided with links to the office ashore and home. The potential for the use of technology for ship operations, training purposes, social needs and for personal education needs is tremendous.

Maritime educational institutions also face the challenge today of utilising new technology, communications and teaching methodologies in order to enhance the learning environment of tomorrow. Whether offering on-campus or off-campus courses, computers and IT resources are rapidly becoming indispensible delivery tools. We may not like these trends as traditional educationalists, but they are here to stay and students expect that their educational needs will be increasingly centred around such platforms in the future. This demands the provision of the best in new technology and the development of new teaching techniques by teachers while still maintaining the best practices of education. MET institutions need to consider the opportunities that the Internet and World Wide Web links offer them in relation to future global collaboration. Let us consider some key aspects.

2. Developments in Information Technology

2.1 Global Connectivity

The Internet and the World Wide Web today have become the indispensible tools of the Information Society, using a common language for seamless communication across networks. According to Netsizer (2002) the Internet today comprises more than 192 million domain servers or hosts. CyberAtlas (2002) also estimates the number of Internet users at 445 million in August 2001 rising rapidly to 709 million at the end of 2004. Governments, business and general community services are increasingly dependent upon the Internet. For education institutions it is rapidly

becoming the backbone of many of their operations and services. Few institutions today do not have a Web page advertising their portfolio of products and services. On land we take for granted the growing availability of broadband links. When we send an e-mail from Europe to say Australia, we do not concern ourselves with the route it takes which may be a combination of varied land routes and undersea cables. The short time taken however never fails to astonish us. However when we open up an Internet site, the download time for a complex web page may be considerable if low technology links are being used, with resulting frustration! In parallel the demands for digital data storage are also growing very fast. For ships, direct access to land based telephone lines, coaxial cables or fibre-optic connections is out of the question and they have to rely on satellite links at sea for broadband connections to land links. Satellite links are still an expensive medium when talking of broadband capability, but access will becoming easier and cheaper through future new services.

Let us take a look at where other technology links are heading? Consider Internet voice technology, real time video and conferencing services, distribution of resource materials and delivery of online e-lectures for example. Many of these require broadband connectivity. It is often overlooked that many of our daily communications go through undersea cables. Mills (1998) estimated that there were more than 600,000 kilometres of fibre-optic cables on the floors of the world s seas, a figure still increasing rapidly according to Hudson (2000). The Fibre-optic Link Around the Globe (FLAG) cable between Europe and Asia (FEA) that opened in November 1997 is 28,000 kms in length using a mixture of undersea and land based fibre optic cables. The China-US cable (opened in 2000), at 30,000 kms length, has a total capacity of 80 gigabytes per second, enough to carry four million phone calls simultaneously. However, FLAGs latest multi-terabit dual cable under the Atlantic Ocean (FA-1), which opened in September 2001, has a capacity of 2 x 2.4 Terabytes which means an ability to transmit up to 30 million simultaneous clear-voice transmissions or 200 hours of video every second. To meet the urgent need for better communications in Africa ambitious plans have been formulated to ring Africa (Africa One project) with 32,000 kms of undersea fibre-optic cables with some 30 landing points at key coastal cities (Cybergeography.org)

Looking at satellite communication links, current Inmarsat High-Speed Data (HSD) services are rated at 56/64 Kbps. VSAT technology can lead to rates up to 2 Mbps. These services are still relatively costly for the individual. Some future services however may provide a better cost solution. New generation Inmarsat 4 satellites will provide up to 432 Kbps. Inmarsat s Mobile Packet Data Service, which became available to the maritime industry in November 2001, enables the MPD terminal on a ship to become just another terminal to the Internet having continuous connection. You only pay for the packet you send. A future development with potential is Teledesic - a satellite based global «Internet in the Sky« service offering, through a constellation of non-geostationary satellites, a wide range of data, voice and video communication capabilities. A variety of user terminals will accommodate "on-demand" single channel rates from 128 kbps up to 100 Mbps on the uplink and up to 720 Mbps on the downlink.. Teledesic plans to start operations in 2005.

Plans for replacing the current Internet Protocol with Next Generation Internet (NGI) using IPv6 are already gathering momentum as the current Internet capacity of IP addresses is rapidly used up. Broadband research in the USA (e.g. Abilene Project) has reached the stage where the entire USA Library of Congress could be transferred in just 7 seconds! Many governments have initiated national projects to provide access to broadband technology for education and the business community at large.

So high speed connectivity is likely to be assured on the land and undersea. Can ships expect to have access to broadband Internet, e-mail and streaming video links anywhere, anytime in the future? Trials are being conducted in a number of countries using satellite communications, CBT and distance learning methods for onboard training, education and leisure activities. Norwegian ship operators and management companies have designed vessel specific training systems, using CBT modules onboard and at locations ashore (Marintek, 2002). Many owners are pursuing such a path. Using current and planned communication links and services for training outreach and interactivity onboard and ashore offers much potential for interaction between personnel on board and shore based training programs and tutors (shipowner or institution).

Looking to the future, it is clear that many shipowners have embarked down a path increasingly centred on the concept of the IT office-at-sea . By 2005 there will be very few ships not equipped with LANs and computers. By implication, there will be demands for retraining or employment of officers and crew who have a capability and confidence to operate within such a world. Shore-based personnel will also need to extend their knowledge and skills to interact with the changing environment. Will port and shipping industries use continuing education as a vehicle for

the retraining and upgrading of their employees in the workplace? The lead taken by Australia in using distance learning to provide working personnel in the port and shipping industry with access to continuing education is a model the rest of the maritime world should consider. MET institutions will need to consider what role they can play in providing a broader range of educational services. They will also need to determine if they are prepared to provide the necessary communications and computing equipment and teaching skills to deliver such courses in the future.

3. Developments in Distance Learning

Today we have the technological keys to unlock the traditional system of learning to free people to pursue lifelong learning anywhere, anytime. Technology is altering all the traditional ground rules. Cyberspace education operates without frontiers, walls or barriers. It is an interactive learning environment, globalized by technology links. It is a concept that can just as readily find a home at sea as ashore in the future. The combination of computers, networks and multi-media capabilities is clearly a formidable educational tool. But distance learning is more than just sitting at a computer terminal accessing the Internet.

What do we mean by the term distance learning or distance education ? Willis (1994) considered that Distance learning takes place when a teacher and student(s) are separated by a physical distance, and technology, i.e.voice, video, data and print, is used to bridge the instructional gap . Open learning lays the emphasis more on learner choice than on the provider. Correspondence courses , popular forms of self study and self improvement in the pre-1970s should not be confused with distance learning programs for two reasons, firstly they lacked structured learning material and secondly, and most importantly, the means of communication were extremely limited and slow.

The characteristics of distance learning can thus be described as enhanced access to learning resources, program outreach, and student interactivity (asynchronous or synchronous). Outreach means that learning can take place anywhere at anytime. Interactivity ensures the student does not learn in isolation. However the focus of learning is now student centred.

Let us examine some current activities. For example, the British Open University (2002), the foremost distance learning institution in the world, currently has over 160,000 students using the university s online e-mail conferencing system. 178 OU courses require the student to have online access. In 2001, the university produced 773,000 CD-Roms, 30,000 Floppy discs and 3,000 DVDs. The University of Phoenix (2002), the largest private University in the USA with 116,000 students, has online plans to convert itself into a bookless college through the use of e-textbooks. Some 60% of its 37,600 distance learning students have their course fees reimbursed by their employers, reflecting growing acceptance of online learning. Athabasca University (2002), which for 30 years has been Canada's leading distance education specialist, now has some 24,000 distance-education students, 550 distance education courses, and 60 distance education programs. Dunn (2000) suggested that more than 50,000 University level courses were now available through distance learning delivery systems.

The University of Washington (2002) offers abbreviated versions of its short courses online at no charge. MIT Knowledge Updates (2002) broadcasts live and synchronous ten minute segments via satellite and Internet using PIVOT (Physics Interactive Video Tutor). Students can access PIVOT 24 hours a day, every day. Even more momentous was the decision by MIT, in April 2001, to place all of its more than 2000 courses online by 2010 through its Open CourseWare Project (Goldberg, 2001). Work commenced in November 2001. These materials will be freely available online to anyone.

3.1 Globalisation of Education

The trend towards globalisation of business has spread to the international education sector in the last few years. The cyberspace world of education is no exception. Recently announced initiatives in e-university developments include proposals by the Higher Education Funding Council for England to set up a consortium of UK and overseas partners to create a virtual e-university without a physical campus, at a cost of £200 million. Goddard (2000) reported that News International has formed a partnership with 21 Scottish Universities to market and distribute distance learning courses. Educause (2001a) stated that Thomson Learning and Universitas 21 (a consortium of 16 universities) have agreed to put up $25 million each to develop degrees in business and technology for the Asian and Latin American market. Centred in Asia, it will draw upon Thomson s textbook division and 100 e-learning courses from the constituent members. The Global University Alliance (2002) is another global university group with ambitious

plans. Hardly a day passes without another cluster of educational establishments announcing their arrival on the distance learning scene. Some institutions have developed off-campus cyberspace centres to provide a potentially larger student population with a gateway to ongoing education.

To effect distance learning delivery today, many institutions employ a Web based Education Management System (WEMS) using ready-made platforms such as Blackboard, WebCT, Lecando or Luvit to mention but a few. These are actively used to deliver and manage institutional distance learning programs. However, not everyone involved in distance learning considers that such platforms are satisfactory for academic purposes. While WMU plans to develop its own system, MIT and Standford University (2002) are developing, through their Open Knowledge Initiative (OKI), a free online course management system. It is expected to be available in late 2003.

Such is the pace of growth in distance learning delivery that it has been predicted by the Association of Governing Boards in the USA that as many as one third of the existing independent colleges and universities will close in the next 10 years (Educause, 2001).

3.2 Distance Learning and the Maritime Market

An examination of global maritime institution web sites does not reveal any evidence of great activity in delivering maritime distance learning courses, a view supported by research (Muirhead, 2001). In Australia, students have had access to maritime distance learning courses through the Australian Maritime College since 1987. Market research showed a clear desire by many individuals working in maritime related jobs shore to pursue further qualifications. Today they can enrol in postgraduate certificate, diploma and Master degree distance learning programs in maritime management, maritime business, stevedoring management, and marine surveying utilising printed and online instructional material, the Internet, e-mail and tele-conferencing, without having to step inside the institution. Most students are employed in jobs ashore. New areas under development include certificate of competency courses for deck watchkeeper and shipmaster.

A number of centres in Britain, including the Centre for Advanced Maritime Studies in Edinburgh, the North West Kent College and the Institute of Chartered Shipbrokers in London, between them offer a range of courses by distance learning covering ship and port management and operations, marine surveying, ship agency and maritime law. The FUMAR project in Norway started in 1997 and involves the collaboration of four maritime academies, offering 9 subjects between them by distance learning including management, navigation, GOC, finance, law etc.

3.3 The Seafarer and Technology

At sea, technology has the potential to allow much refresher and upgrading training to be carried out onboard that currently require seafarers to attend a course ashore. Digital ship (2001) reported that Maersk Line had placed sixteen SimFlex simulation systems onboard their ships for use by cadets for rule of the road and basic shiphandling training, with potential tutor links to the Institute ashore. Even at ratings level distance learning programs for career advancement to watchkeeper level have been available onboard ships in Australia for some years now. For the mariner, the opportunity for private study at sea, a service long denied him or her, will become reality as Internet links become more common onboard ship. Access to web based communications such as net-chat, net meeting and news groups has further extended the range of possibilities. Why shouldn t the mariner be able to take an educational award program at sea via an Open Learning University or from a delivering Maritime Cyberspace Education Centre in future?

Surveys by NEA (2000) showed that e-mail is the preferred mode of communication by over 70% of distance learning students in the USA. There is no reason why students at sea should not develop similar level of access to course tutors. Support through CD-ROM and online marine databases ensures that library information can be readily available. Software companies such as Videotel and Seagull are leading the way in providing maritime related learning resources in an easily accessible format at sea.

Overall then, there is no technical reason why many aspects of education and training could not be carried out on a ship as well as on shore through the supportive medium of distance learning. The real constraints are developmental costs of materials, access to computing and communications technology, course fees, availability of learning time and self motivation. The motivational aspect of persuading crew members to use CBT methods to enhance their knowledge and skills needs careful attention. However, distance learning methods combined with IT resources have the potential to extend the regime of learning to both the shipboard environment and the shore based workplace.

Many large commercial businesses today run their own internal training centres , utilising distance learning methods, IT and communications technology to full advantage. The potential for a greater collaborative effort between the maritime industry and MET institutions to offer and deliver quality training and/or educational services to those at sea and ashore remains great.

4. A survey of MET Institutions on the future use of new teaching technology and methods

A recent program of research (Muirhead, 2001) undertook a comprehensive survey of MET institutions around the globe, focusing on current and future use of new teaching technology and methodologies. The 90 institutions responding produced an interesting picture of capability and future intentions.

4.1 Staff access to technology

Table 1 Academic Staff Access to Computing Technology and Multi-Media

Region	Europe	Asia-Pacific	Africa M-East	America	Global
Resource	Yes%	Yes%	Yes%	Yes%	Yes%
CD-ROM, DVD	93	80	50	91	83
CD-RW drive	93	60	50	100	79
Scanners	90	88	67	100	88
Laser printers	95	88	67	75	87
Colour printer	95	80	67	91	87
Digital camera	76	48	25	83	62
Multi-media	54	72	42	42	55

Table 1 shows that there is a high degree of access by academic staff to CD-ROM, CD-RW, printer and scanner technology in Europe and America, and reasonably so in Asia Pacific. There is room for growth with compact disc technology and printing support in the Africa-Middle East region.

4.2 Staff Training and Use of CBT Laboratories

The outcomes show globally a high level of use of computer laboratories for group learning and CBT (77%) yet only 64% of institutions offer training to academic staff to use such equipment in the learning process (Figure 1). One of the key outcomes of the METHAR European MET research project was the notable lack of training in new technology for teaching staff in maritime academies in Europe.

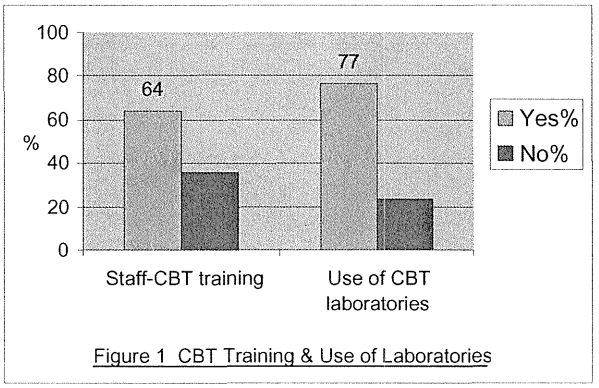

Figure 1 CBT Training & Use of Laboratories

4.3 Maritime Courses by Distance Learning

It is probably not surprising that distance learning courses are not offered by institutions in the Africa-Middle East region, as the survey provides clear evidence of a lack of availability of technical resources to warrant it. Access to maritime distance learning courses is highest in the Americas according to the survey returns, but USA maritime

academies do not show evidence of offering much in the way of maritime distance learning courses on their web sites.

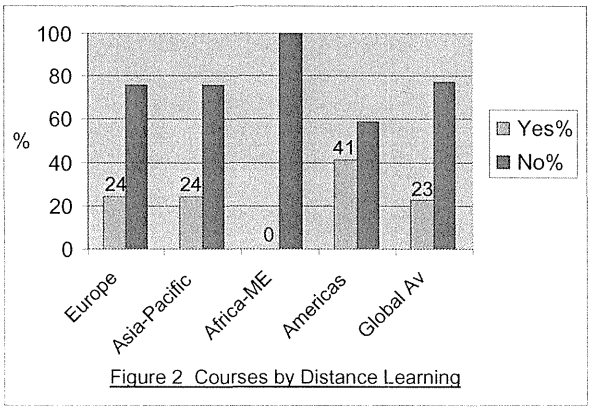

Figure 2 Courses by Distance Learning

4.4 Future developments

Future developmental intentions of institutions up to the year 2005 were sought, with the focus particularly on two aspects, firstly that of computer technology and its use in the internal teaching and learning process, and secondly that of external delivery via distance learning using online communications and multi-media tools.

Table 2 Future Developments (2000-2005) - by Region
(percentage of positive responses)

Questions°: Do you plan to°:	Europe	Asia-Pacific	Africa-ME	Americas
Create CBT Laboratories?	78	81	100	91
Give all students e-mail access?	64	75	75	100
Give all students Internet access?	68	70	82	100
PC projectors to all classrooms?	59	73	75	80
Give IT/CBT training to teachers?	94	96	92	100
Purchase new simulation facilities?	78	82	73	67

There is a general desire to create CBT laboratories with modern PC based equipment. These two aspects go hand-in-hand. Apart from the Americas, there is less than full enthusiasm for giving students access to e-mail and the Internet. There is an overwhelming acknowledgement that the teachers need special pedagogical training to use new technology and methodologies effectively. The lack of experienced practictioners in the CBT and distance learning field is another negative factor to translating expressed developmental desires into practical reality. The reported failure of a number of well known distance learning ventures in the USA in the last 12 months (Temple, Columbia, DePaul and US Open Universities) illustrates the difficulties of getting a sound foothold in the market (Educause).

Responses to future intentions in the area of distance learning were as follows:

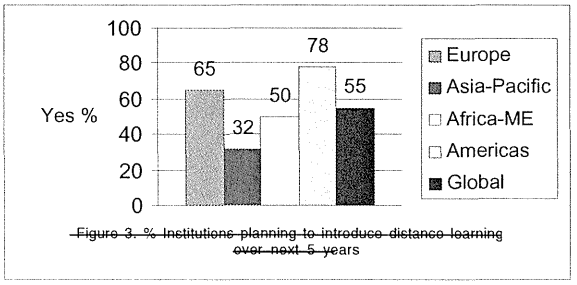

Figure 3. % Institutions planning to introduce distance learning over next 5 years

Generally the Americas and Europe are more enthusiastic for this means of delivery, whilst the Asian region in particular does not see it as a major area of development in the near future.

Table 3 Plans for developing maritime courses through distance learning
(Percentage of positive responses)

Questions: Do you plan to:	Europe	Asia-Pacific	Africa-ME	Americas	Global Av
Develop DL materials in house?	89	41	83	100	75
Use a Web site to manage DL?	80	43	100	86	72
Develop a multi-media studio?	61	53	71	44	57

There was high level of interest (75%) from the 44 institutions that gave a positive response as to whether they planned to offer maritime courses via distance learning in the next 5 years, by developing their own distance learning materials in-house. The least enthusiasm for this approach was in the Asia-Pacific region.

Overall the results of the survey indicate that MET institutions are well aware of the importance of using computing and CBT now and in the future, and many are making a determined effort to meet industry s future needs. Many others clearly lack the expertise and the funds to develop such capabilities without additional support from industry and governments.

5. World Maritime University —Developments in Technology

The World Maritime University itself plays an important role in providing a pathway for graduates across the broad spectrum of the shore-based maritime industry. Since 1983 over 1700 students from 144 countries have graduated and taken their educational experiences back to serve in the administration, port, shipping and education and training sections of the industry.

The quality of academic standards and credibility is dependent upon many factors. In today s modern educational world, the provision of up-to-date computing and Internet services is crucial. Since 1997, all staff and students have had access to and use of email and the Internet, by links through the Swedish University network SUNET. Through 1998 and 1999 the WMU network was upgraded and all computers and accessories in the WMU were replaced.

A new multi-functional multi-media interactive computing laboratory holding 20 computers was opened in 1999, creating new avenues for the instructor and teaching methods. During 2001, a second laboratory of 25 computers was modified, to provide the instructor with a similar interactive capability. At the same time live audio and video links were created between one of the laboratories and an adjacent classroom for trialing of distance learning delivery techniques. A small multi-media studio is planned for 2003 so WMU can produce some of its own educational materials for internal student access and external delivery. The University supplies each student in the hostel with a computer that is linked to the WMU network.

The PC-based laboratories today provide all the IT and multi-media support required for the highly acclaimed WMU English Study Skills Program (ESSP) as well as Computer Assisted Learning (CAL) in the academic programs. Figure 4 opposite provides a general view of one of the multifunctional laboratories.

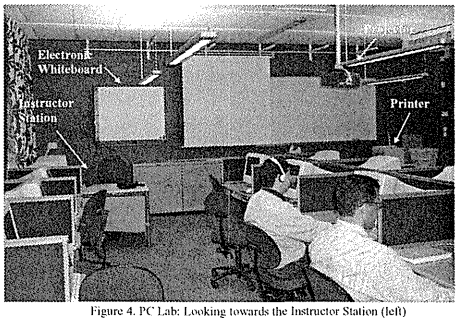

Figure 4. PC Lab: Looking towards the Instructor Station (left)

The technical design allows data or digital signals to be taken from the Network, Internet, Electronic Whiteboard, Pointmaker, video visualizer camera, VCR, TV and other sources through the instructor PC to the students PCs via ComWeb, to the large screen via the SVGA projector, and to VCR or TV. The Visualizer is a particularly versatile tool which, when used in conjunction with a TV monitor or video projector, allows for images of documents, overheads, slides, and negatives to be presented at a very sharp level of image. Figure 5 over illustrates the schematic layout of the multi-functional laboratory.

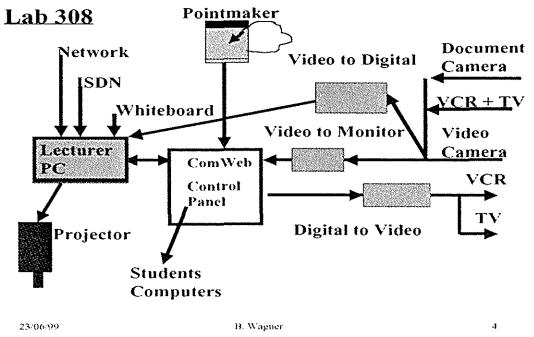

Figure 5. Laboratory Schematic Layout

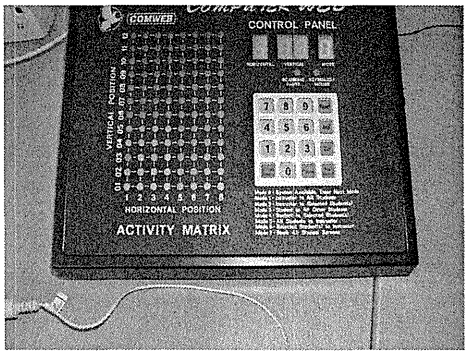

Figure 6. ComWeb Control Panel

The instructor can communicate to any combination of the 20 student computers in the room, show any form of media display on the monitors, on the large screen, interact directly on student screens or allow students to take control of classroom activities. This is achieved using the COMWEB KnowledgeWeb system shown in figure 6 above. The panel is a special-purpose, hybrid, monitor-keyboard-mouse-audio-video-data switching device controlling an array of analog and digital sources and functions.

Stepping from the world of delivering conventional classroom lectures to engaging students through a computer assisted learning laboratory is a challenging and daunting task. Delivering courses «at a distance presents further challenges to the teacher. Some issues to be considered include:

1. What does it mean to learn at a distance ?
2. How to engage the attention, motivation and involvement of the student in these environments?
3. How to develop effective links between visual materials and student understanding?
4. How to prepare study materials for the learning environment?
5. How to communicate effectively with a student at a distance ?
6. Can the classroom experience be replicated for learners at a distance?

6. Technology and connectivity for collaborative global roles

6.1 Can we create a collaborative Web-based MET centre?

WMU is the lead partner of a European Union thematic network research project called METNET. The purpose of this project is to improve the quality, harmonise the contents and extend the applicability of MET in the European Union. The network acts as a cluster for the exploitation of results emanating from related previous research projects such as METHAR and MASSTER. In this way much of the unfinished business of these projects is being carried forward to applied conclusions. It involves collaborative effort between institutions, industry and government bodies.

As an example of cooperation, a number of train the trainer courses are being created by small teams in Europe dealing with the use of marine simulators, marine pollution, and the impact of modern technology in teaching. The research teams have made good use of the Internet, Web and FTP sites to develop the courses collaboratively. The establishment of online connections to create a working communications environment that will enhance collaborative activities is technically easy. The difficult task is getting colleagues to contribute effectively at a distance , many of whom have other priorities in their schedule. This difficulty should not be underestimated in establishing collaborative links of any kind.

Muirhead (2000) proposed a regional cooperative cyberspace simulator training centre with web site access to a range of simulation training software, exercises and assessment. A collaborative MET centre based on the models described earlier (Universitas 21, GUA) is quite feasible, but one needs to be clear on the purposes and advantages to be gained in establishing such a centre?

6.2 How might distance learning & online connections be used to create a communications environment?
WMU itself is currently creating a comprehensive academic intranet to provide a more interactive site between the registry, academic programs, lecturers and students. Future developments involve the evaluation of WMU s web education management needs for delivery of distance learning modules. The creation of the latter is being considered for future outreach to graduates, on-line access to WMU professional development courses, and delivery of foundation study modules to new entrants. Links between laboratories and lecture rooms for seminar activities for example, development of in-house study materials from a multi-media studio, and direct delivery of WMU lectures to regional centres around the globe are some of the initiatives under consideration for the future

We have seen that communications technology and web based management software is readily available to create a communications environment for global interactivity between MET institutions. Several examples of web based groups of international education institutions have been identified. IAMU needs to determine what is the purpose of developing a collaborative network — data exchange, collaborative research, delivery of courses online, creation of common standards? Such a platform will need considerable investment in people, time and money to bring it to fruition and keep it dynamic and active.

6.3 How might IAMU use such technology to develop a collaborative role in global MET?
The IAMU membership comprises universities and university level colleges around the globe. All have varying levels of access to the Internet and e-mail services. The degree of access to computers, Information Technology and multi-media tools by staff and students is not uniform but is sufficiently well developed to provide a sound base from which to develop an interactive communications platform. The key issues to be faced in creating such an IAMUNET are the policies, purposes, platform specifications, developmental and operational funding, and site management. The failure of several distance learning centres in recent times leads the author to issue a word of caution in getting too ambitious too soon. Perhaps IAMU would be wise to establish a user group through Netscape or Yahoo! at first to see if members of an IAMU consortium are sufficiently motivated to make it work online.

7. Conclusions

Computing and communications technology are here to stay. Many MET institutions are endeavouring to ensure that they are equipped for a future role that will incorporate the use of information technology resources, distance learning methods and well-trained academic staff. In the field of education, a number of universities have formed international education alliances to deliver courses by distance learning globally. It is too early to see whether they will be successful. It is evident that there is a clear technical capablity of developing an interactive and collaborative network between different IAMU institutions around the world. What is not in evidence yet is whether the skilled and motivated human resources, needed to establish and make such a network successful, are both available and willing to achieve this.

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