Online Distance Learning: Expectations, Requirements and Barriers

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ABSTRACT

This paper discusses the specific experiences and findings observed from a feasibility study into the introduction of Online Distance Learning (ODL) for the delivery of a variety of technology-related M.Sc. modules and industrial short courses. The investigative approach is described, which included consultation with both the academic staff responsible for the delivery of the modules in a traditional face-to-face context and representatives from relevant industrial companies, to whom it is considered that ODL delivery may particularly appeal. These stages enabled a number of requirements and expectations to be assessed and the paper proceeds to discuss an overall ODL framework which has been devised in order to address them. The paper also draws attention to a number of potential barriers to ODL, which universities and other learning providers will need to address if their strategies are to be successful.

KEYWORDS

Online Distance Learning, WWW, Requirements, Industry, Barriers.

INTRODUCTION

Information technology is now seen as an essential feature at all levels of education, as both a facilitator of learning and as an increasingly important skill in itself. The capabilities of technology have advanced significantly in recent years and, in conjunction with delivery technologies such as the World Wide Web (WWW), it is now possible to view IT networks as a medium through which entire learning programmes can be conducted remotely. This concept is referred to as Online Distance Learning (ODL).

Learning is a process performed in a different way by each individual. This implies that for any educational course to be effective, it must be adaptive to the needs of each student, as each student will have different goals, and will take different paths when attempting to reach those goals (Brusilovsky et al., 1998). This makes the task of placing the learning environment on-line

especially difficult, as the lecturer is not necessarily available to provide adaptive guidance to the student. Fortunately, the web's use of hypermedia enables such courseware to be developed with links which can enable the student to navigate through the course in whichever direction they feel most comfortable with.

ODL offers a number of benefits, to both the students and providers of educational services. From the student perspective, one of the most significant advantages is that ODL enables access to appropriate expertise and resources irrespective of distance. This is particularly beneficial in contexts such as students within the workplace, who would otherwise be required to travel to a university or college in order to update their skills. Access from within the workplace significantly assists in the realisation of concepts such as lifelong learning (DFEE, 1998). Another potential advantage to the student is that ODL may be used to facilitate on-demand learning, allowing them to pursue their studies in a manner that suits their own individual schedule (the degree to which this is possible will depend to a large extent upon how the concept is realised by the learning provider. For example, simply allowing remote participation in normal lectures via video-conferencing, whilst still constituting distance learning, does not permit an on-demand element). From the learning provider viewpoint, ODL offers an immediate advantage in terms of an increased 'market' for their educational services and course programmes. Use of technologies such as the Internet and WWW effectively opens a global market and would enable students to be enrolled who would otherwise have been totally ruled out on grounds of distance. From an academic perspective, ODL would enable collaboration with other educational institutions to establish high-quality 'virtual' programmes, drawing upon relevant expertise from various, geographically diverse, sources (Cochrane, 1995).

It is also possible to identify potential limitations with the ODL concept, from both academic and social perspectives. From an academic standpoint, the principal concern is that delivery of courses via ODL will lead to a dilution of the learning experience and the associated educational value. This could conceivably occur as a result of a reduction in direct contact between students and lecturers, as well as the omission of course elements that cannot be so easily delivered at a distance (e.g. practical work that is reliant upon specialised equipment). From a social perspective, students may suffer from a lack of interaction with their peers (which would be implicit in traditional face-to-face programmes), potentially leading to feelings of isolation and reduced opportunities for developing skills that require interaction with others (e.g. teamwork). The degree to which such limitations are apparent will depend significantly upon the way in which the ODL approach is realised and, thus, will vary between establishments.

The potential offered by ODL has been recognised by a number of projects and initiatives in recent years. This encompasses efforts by established providers of distance-based education (such as the Open University), as well as other organisations (such as that of the authors) that have traditionally focused upon attendance-based provision. Establishments in the latter group are increasingly perceiving that a proportion of their future business will come from the ODL domain and, as such, can be seen to be moving in this direction. Whilst there is currently by no means a full choice of online study options available, many establishments can now be found to

be offering a small number of prototype / trial programmes. In addition, efforts are being made to establish overall frameworks for the creation and interoperability of ODL programmes, enabling the mixing of modules from different providers (Educom, 1997). However, at the time of writing, such facilities are some way from practical realisation and, as such, early adopters of ODL must forge their own path to some extent (although design decisions can at least be informed by knowledge of what may be coming).

This paper describes the findings from a study into the feasibility of introducing ODL technologies into the delivery of technology-based M.Sc. modules / short courses within the University of Plymouth. The remit of the work included consultation with the academic staff responsible for module delivery in a traditional, face-to-face context, as well as representation from industrial companies, who are considered to be the main target audience for ODL delivery. In both cases, the intention was to determine the requirements and expectations of ODL, which were then fed into the design of a generic framework specification. The investigation also aimed to identify any potential problems that might impede ODL implementation in practice.

The remainder of the paper is structured as follows. The next section considers the views expressed by the academic staff involved in the investigation and highlights the key requirements that they perceived. This is followed by a series of summarised results from the industrial consultation exercise.   The main architectural recommendations are then presented in a description of the resulting ODL framework that has been suggested. The discussion then considers some of the potential barriers to the successful implementation of ODL, as identified by the academic respondents.   The final section then presents overall conclusions.

VIEWS FROM ACADEMIC STAFF

A key aspect in providing online course programmes is the nature of the modules to be provided or converted and the attitudes of the staff that are responsible for their delivery. As such, a total of eleven existing M.Sc. modules (several of which are also offered as industrial short courses) were assessed to determine their suitability for online delivery. These modules were selected from two M.Sc. / Pg.D. programmes currently offered by the University of Plymouth (namely 'Integrated Services & Intelligent Networks Engineering' and 'Communications Engineering & Signal Processing'), with several of them being shared between both courses. The assessment considered a number of factors, including the type of information presented, the presentation style (e.g. the lecturer's current delivery methods, such as slides, whiteboarding, handouts etc.), the availability of additional background material from other sources and the requirements for practical work. These factors enabled an overall indication to be obtained regarding the suitability of the course content for online delivery. As was anticipated, the only significant obstacle in these terms was in relation to practical work, as several of the modules currently rely upon laboratory-based work and equipment (which remote students could not be expected to replicate). However, it was considered that, in some cases, an appropriate substitute could be realised via the use of simulations and other computer-based

tools which could be disseminated online. The key issue in this respect was the fact that such facilities do not currently exist and would need to be created specifically for the ODL delivery.

The evaluations of the modules were conducted in consultation with the related academic staff. This provided an opportunity for their more general views regarding ODL to be obtained. This is important because staff must be both *willing* to create the content in a format appropriate to online delivery, and *able* to create effective material. The latter implies some consideration must be given as to whether the staff should be trained in the use of the tools required for the creation of the course content (O'Reilly and Patterson, 1998). The lecturer's views highlighted a number of requirements that they considered necessary to the effective realisation of an ODL experience.

- *Course Content*. Creating a course for delivery in an online environment is very different to the creation of the same course in a traditional lecturing environment. Attempts must be made to solve the problem of the lack of real interaction between lecturer and student. This interaction is the basis of much information transfer from lecturer to student and, as it cannot be emulated to the same degree online, the notes and information available to the students must be correspondingly better than they would be in the traditional environment. 'Better' here means both a higher quantity of information, and a higher quality: the notes must potentially reach very deep levels of understanding, if the student is to rely principally on them for learning.

  All of this, of course, takes time. The notes must be written in both a different style, and to a different depth than they currently are, and if online techniques such as hypertext are to be employed, then more time must be spent searching through the notes to highlight the appropriate places to insert such hyperlinks.

- *Monitoring.* Another common theme amongst the lecturers was monitoring of the students. Many felt the current situation was inadequate, as the only real way to monitor students' progress is through the assignments and exams, after which it is too late to aid struggling students. Online techniques could possibly be of benefit here, as most lecturers liked the idea of being able to maintain a record of the dialogue with students for later reference. The concept of using online quizzes to monitor a student's progress was also greeted openly, provided the time is given to the lecturers to create them.

- *Interaction.* All felt that interactivity between students and lecturers must be maintained as much as possible. Some lecturers rely heavily upon such interactivity, but it was felt that being able to see students enabled a degree of feedback as to how well they were absorbing the information, whilst others looked on the process of presenting a lecture as a performance in its own right, and the feedback from the 'audience' was important to the lecturer's style of presentation. This would, therefore, need to be considered in the realisation of any online lecturing approach.

A number of concerns were also voiced, but these were of a more general nature, relating to the realisation of ODL from an administrative perspective. As such, they were not considered to influence the technical realisation of the ODL framework required. However, the main points raised are discussed later in the paper, under the potential barriers to ODL.

INDUSTRIAL EXPECTATIONS AND REQUIREMENTS

Modern society is now beginning to place significant emphasis upon the concept of lifelong learning. This recognises the importance of people in the workplace being able to update their knowledge and acquire new skills via continued access to education. This is the concept behind initiatives such as the UK government's University for Industry scheme (Sainsbury, 1998) and is an area in which ODL clearly has a role. Industrial expectations and requirements are obviously important in ensuring that any ODL solution adopted is appropriate to the target audience. Our feasibility study attempted to assess these expectations in two ways:

1. A postal survey distributed to personnel / training managers in 100 companies to obtain general feedback on their expectations of online courses and the availability of the required technologies in the workplace. The companies selected were either those working directly within the engineering / IT domains targeted by the MSc programmes or those considered likely to have significant internal departments relating to such activities. A mixture of large organisations and small enterprises were contacted.

2. Interviews conducted with a small group of local companies to get more detailed opinion / additional information.
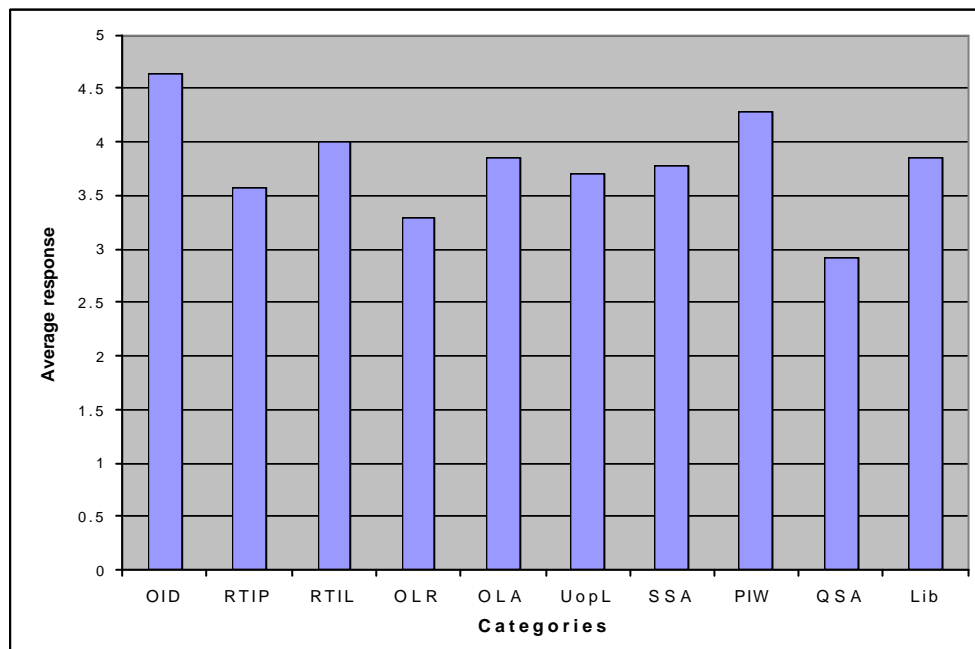
Survey responses were received from a total of 18 companies. The survey content considered a number of issues that were felt to be important in determining the nature of an ODL offering. In addition, a total of eight companies were consulted in more depth as part of the second activity. These were selected on the basis of being the largest technology-related respondents within the general geographic region of the university (and, therefore, candidates for the provision of future online trainees). The findings presented here are primarily based upon the statistical results from the survey, with supplementary comments added as necessary to reflect additional information collected during the interviews.

The most important overall issue is what the organisations would expect as part of the ODL experience. The survey asked respondents to rate the importance of a number of features, using a scale from one (not at all important) to five (very important):

- online information delivery (OID);
- real time interaction with peers (RTIP);
- real time interaction with lecturers (RTIL);
- online registration (OLR);

- online assessment (OLA);
- access to University library facilities (UopL);
- student self assessment (SSA);
- practical / interactive work (PIW);
- quizzes as a means of student assessment (QSA);
- access to other library facilities (Lib);
- other.

Figure 1 details the perceived importance of each of the characteristics. It is shown that the most important aspects are online information delivery, and also practical or interactive work. However, it is interesting to note that, with the exception of quizzes, all means of student assessment are considered to be of above average importance. Amongst the 'other' topics suggested were online technical and student support services, the ability to review modules without having to go through all of the material again (i.e. non linear review) and the ability to download a module or module topic as a whole and browse it locally (therefore reducing the amount of time spent online).

Figure 1 : Average importance of potential online course techniques

The respondents were also questioned to determine whether there was a requirement for the delivery of information in ways other than using on-demand WWW browsing by the student. The responses indicated that a high percentage of respondents would expect at least some real-

time delivery, either through video conferencing (38%) or face-to-face delivery (53%). This expectation could be explained by a point raised by some of the interviewees for the second aspect of the exercise. Some felt that if the only way the information is delivered is online, then there is little explicit timetabling as to when the course is carried out. Therefore, it would require a great amount of self-discipline on the part of the student to satisfactorily carry out the course. If a real-time element is added, where the individual does have some of the course delivered at set times, there is more structure and control to the course.

Having established the anticipated features and the expected delivery approaches, the next issue of relevance was considered to be how often the employers would expect their staff to conduct online learning. This helps determine how structured the course is expected to be – one could assume that, in an online delivery framework, flexibility is the most desired aspect. The results showed that 69% of the respondents expected training activities to occur on a weekly basis, with 46% feeling that less frequent (intermittent) participation would also be acceptable. None of the respondents indicated that they would expect their employees to participate in ODL on a regular daily basis.

One concern that the authors had in mind at the outset was that the provision of assessment and practical work entirely via ODL methods might be impractical. As such, the companies were asked whether they would be willing to allow employees to travel for these purposes. An unfavourable response would necessitate the development of far more complex means of enabling interactive practical work and assessment within the online framework. However, in the event, all respondents were willing to allow travel for assessment purposes, whilst 93% would also permit it for practical work.

Whilst it is assumed that any organisation willing to support ODL study has access to web browsers, there is a question of whether it would be willing to commit additional funding for the purchase of new equipment and software that may be required. A positive response to this question would obviously allow greater flexibility in specifying technologies for the baseline framework. The results suggested that 79% of respondents were willing to accept additional expenditure. The vast majority of the negative responses came from Small to Medium Enterprises (SMEs), who typically have greater financial constraints than large organisations. However, the development of a number of standard levels within the framework could accommodate both.

The final question concerned whether staff would be expected to conduct their training in addition to normal work commitments. It is interesting to note that nearly all respondents (93%) said that the work *would* be additional to existing commitments. This differs from the traditional attendance of a course, where the employee would not be expected to do any additional work when they are carrying out the course, and points to a need for flexible modes of delivery.

With these and other industrial viewpoints expressed, the findings were considered in conjunction with the views from academic staff to produce an ODL framework specification that would satisfy both groups.

SUGGESTED ODL FRAMEWORK

The academic and industrial consultation exercises enabled a number of elements to be abstracted out to form the generic requirements for a recommended ODL framework. These can be split into six key components - content creation; interaction; monitoring; assessment; training and system requirements. Each component is relevant to one or more of the participants that the research team considered would be found within an ODL framework. This is illustrated in figure 2, which is based upon findings from the research study.

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Company                                                      University
Management Issues      Staff Issues      Student Issues      Administration Issues
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┌─────────────────────────────────────────────────────┐
│                      Training                         │
└─────────────────────────────────────────────────────┘

                              ┌──────────────────────────────────────────┐
                              │           System Requirements            │
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        ┌ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ┐
                         Content Creation
        │  ┌──────────────┐  ┌───────────────────────┐      │
           │              │  │   Navigable Layout    │
        │  │Tools for Content│  └───────────────────────┘    │
           │   Creation   │  ┌───────────────────────┐
        │  │              │  │      Flexible/        │       │
           │              │  │    Personalised       │
        │  │              │  │  Course structure     │       │
           └──────────────┘  └───────────────────────┘
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           ┌───────────────────────────────────────┐
           │               Interaction             │
           └───────────────────────────────────────┘
        ┌───────────────────────────────────────────┐
        │                 Monitoring                │
        └───────────────────────────────────────────┘
        ┌─────────────────────────────────────────────────────────────┐
        │                        Assessment                           │
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Figure 2 : Framework Components

The following sections describe the components individually, and give specific recommendations for their implementation.

Content Creation

Content is the information contained within the online module. As such, it includes information in all media formats, including text, graphics, and animation. The term 'Content Creation' covers both the type of information and its presentation (i.e. *what* is being presented and *how* it looks). The content presented to the student is the core component of the entire framework. Like a textbook, it must contain information of a quality sufficient for the student to learn from.
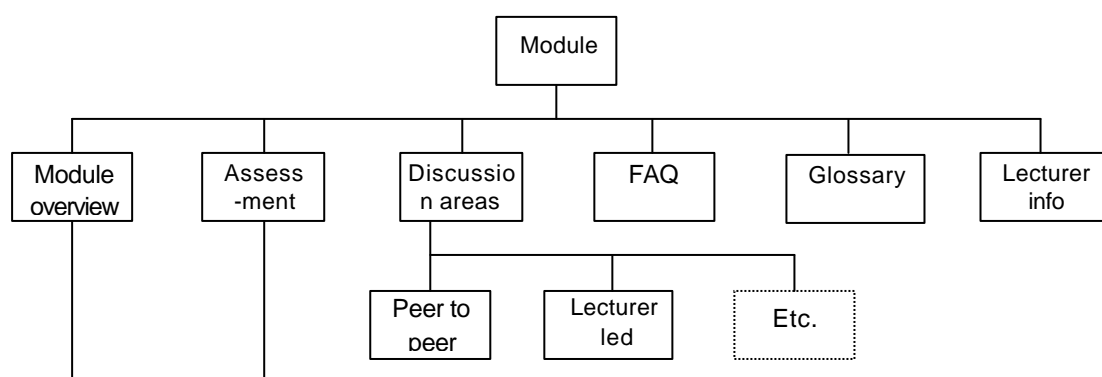
Simply using the web as a repository for electronic copies of documents is not sufficient. Linear text does not translate well to the non-linear world of hypertext, and so some degree of reformatting existing course information must be made (Allen, 1998). However, care must be taken both with the structure of the information and how it is presented. Too many hyperlinks

could leave the student feeling confused, and unsure of where they are in the context of the module. Equally, presenting a consistent look and feel to the course as a whole can help the student to navigate with confidence throughout the whole module.

The information which a lecturer needs to present to the student obviously differs both from module to module, and from lecturer to lecturer, according to the module's requirements, and the lecturer's own style. The following recommendations do not seek to prescribe to the lecturer exactly what content should be created; rather, they define what *type* of content should be created as a baseline. This can ensure that the student has the necessary information available, formatted appropriately, and can help to ensure a consistent approach throughout the framework. As a minimum, the following content components should be provided:

- *Lecturer's slides and handouts* - these should be presented in a readable form, and should be used only to guide students through the online lectures. They should not be seen as the course content; rather, they should be integrated into the framework through hyperlinks to more detailed background information.
- *Detailed background information* - the information should be written in a flowing style, and should be broad enough to cover all key concepts that would be presented in a lecture. The depth should be enough to explain the concepts to the student, but the student will be expected to retrieve more detailed information for themselves from other sources. This material would be expected to substitute for real-time online lecture sessions in cases where students are unable to 'attend' them (e.g. due to varying organisational commitments or, in the case of overseas students, due to potentially inconvenient timing).
- *Frequently Asked Questions (FAQ) archive* - an archive consisting of pertinent questions with suitable responses from the lecturer. This can prevent the lecturer from being asked the same questions repeatedly.
- *Glossary of terms* - key terms must be defined and grouped together in a glossary. These terms, when used in the main body of the information, must then be linked into their definitions.
- *Content linked to owner's e-mail addresses* - all content must provide links to the lecturer who 'owns' it (where 'owns' refers to the person responsible placing it on the module, not necessarily the copyright owner). In this way, if a student has a query, it can easily be sent to the person who placed the content on the module, via e-mail.

The lecturer should feel free to add other components, or to add more detail to the ones specified above. However, the components specified should be seen as an absolute minimum for each module. This would fit within a recommended module structuring approach as shown in figure 3.

Figure 3 : Module content structure

Whilst the information represented by the content will obviously change from module to module, the presentation (e.g. font size and type, background colours) should be kept as consistent as possible across all modules so that both the student, and the lecturers, do not get confused throughout the course framework. Most of this can be achieved by the framework itself, with styles such as font type, font size, colouring, etc., being predefined according to a consistent template. Thus, the lecturer can create the content without worrying about its formatting. However, the information should be well structured as well. Hypertext is a different medium to linear text, and it is very easy to confuse a user by inadequate linking. Thus, the course content should be planned and structured before being committed to the framework.

Clear navigation is also crucial, to ensure the student does not get lost throughout the course. Navigation icons should be consistent across all modules. Again, the framework can provide the icons as part of a standard template for each page. In this way, the lecturer does not have to be concerned with ensuring the overall navigation works correctly, and can focus on the structure and links of the course information being created.

In order to structure the content correctly, meta-information should be specified for each module. More analysis is required to determine the exact requirements, but it should provide at least the following information:

- name of lecturer (or student) who created content;
- course/module name;
- course level (e.g. MSc, short course, etc.);
- knowledge level required (e.g. advanced, intermediate, basic, etc.);
- information type (e.g. key concept, background, defined term, exam, coursework, self-assessment, etc.).

This meta-information can be created using XML (eXtensible Markup Language) (Microsoft, 1998), leading to the creation of a tailored Course Definition Language (CDL) in which mark-up elements could be specifically tailored to represent the information above.
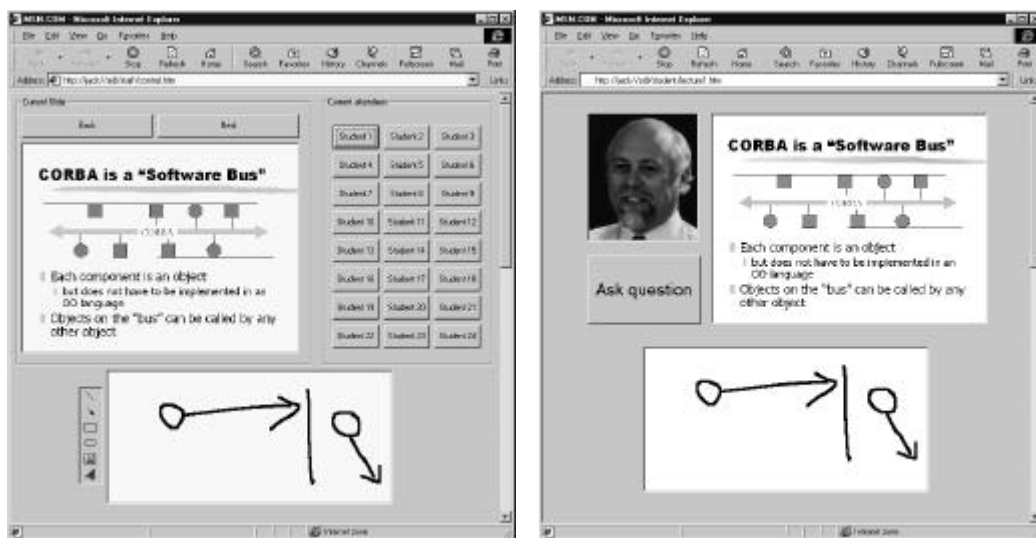
Interaction

The interaction between students, their peers, and their lecturers, is another crucial aspect of an online course. In any learning environment, it is this interaction which most facilitates the learning process. Replicating this in an online context will be the most technologically difficult aspect of the framework to achieve. The effect of the online context upon learning outcomes is discussed by Carswell (1997).

Interaction can be split into two categories: student-lecturer interaction and student-student interaction. The former occurs during online lectures (see below) and when the student has any queries they wish to ask the lecturer about. The latter is designed to foster a sense of community amongst the students, enabling them to share experiences, help and generally get to know one another. At a basic level, standard Internet facilities such as e-mail and discussion groups can be used to realise these concepts. These are text-based exchanges of information, and enable a text message sent by one person to be seen in real-time by everybody logged onto the chat area. Here, for example, students can post queries, and other students or the lecturer can answer them. This could be done during the lecturer's surgery hours, and can be used by the students to test their levels of understanding, and by the lecturer to monitor the students' progress.

Whilst one of the potential advantages of ODL is that it can enable students to work asynchronously from the lecturer (i.e. with on-demand access to relevant course material, irrespective of a strict schedule), this does not preclude the provision of synchronous online lectures (e.g. either as an essential element of a course or as a value-added service). As such, consideration has been given as to how online lectures could be realised (note that whilst the term 'lecture' is used here, the technologies described could equally be used to realise interaction in other contexts such as seminars and tutorials, although different user interfaces might be employed). A basic level would involve online dissemination of standard slide

information, accompanied by Internet chat-type interactivity. The lecturer would control the 'playback' of the slides, making appropriate additional comments, responding to questions and the like via the chat channel in the interim. Another feature would be the inclusion of a 'whiteboard' window in the student's browser. This would enable lecturers to draw diagrams and the like on their systems, which can be viewed, in real-time, by the remote students. Features could also be offered to enable students to add to the whiteboard as well. For more advanced interactivity, audio and video-conferencing technologies could be incorporated. Here, the lecturer could be heard and seen by all of the students taking part. If a student has a question, they can ask the lecturer orally, with other students also hearing what is being said. This overall arrangement is illustrated by the screen layouts in figure 4 below.

Figure 4 : Online Lecture interfaces for Lecturer and Remote Students

In the figure, the lecturer console consists of a presentation area where they can control the presentation of slides to the students, a whiteboarding area (so they can illustrate concepts with sketches, etc.) and a control area that enables them to determine whether any remote students wish to ask questions. The student console has passive versions of the whiteboard and slide areas, a small video window in which they can see the lecturer, and a button that they can click if they wish to ask questions. If the lecturer responds to their request the student can then ask a question via audio or text-based conferencing (in the arrangement illustrated, the lecturer does not see the students).

The various ideas suggested here require the student to have access to different levels of technology. A whiteboard can be implemented using basic web browsing technology, but video-conferencing requires, at least, a high-speed Internet connection. One solution to this

problem is to introduce different levels of technology requirements, depending upon the demands of the module. For example, higher levels would require more expensive technology, such as video-conferencing products, whilst lower levels would require less sophisticated technology, such as e-mail and web browsers.

Student Monitoring

Throughout the learning process, the progress of the student should be monitored at least as much as is currently performed in traditional lectures. However, it would be beneficial if this level of monitoring could be improved to give the lecturer more feedback. This would obviously help the student, but it would also help the lecturer to gain feedback as to which parts of the module are more successful than others.

The means to achieve this are varied, but they can include multiple choice tests and small quizzes, and e-mail audits. The test and quizzes can be automatically assessed to give the student some feeling for their own progress. The e-mail audit can be used by the lecturer to track the e-mails from a student in order that they can gauge both the quality and the quantity of the questions being asked by the student (Sharpe and Bailey, 1998). Finally, a questionnaire can be used regarding the quality of the course notes, so that the lecturer can get valuable feedback on the information presented to the student.

The test, quizzes and questionnaires can be presented to the student at certain key parts of the course. These would be just after key concepts of the course had been dealt with, in order that the student can test their own understanding of the concept, and to reinforce that concept in their mind. The questionnaire can be used to show how well the concept was explained by the lecturer's material (Culverhouse and Burton, 1998).

Assessment

The work the students complete will need to be submitted to the lecturer online. This can be in the form of e-mail, or a specific submission process can be developed using standard web technology. The work can be marked by the lecturer, or, if of a multiple-choice format, can be marked automatically by a suitable application.

The principle problem with assessment online is that of security. It is not difficult ensuring the answers are safe, and that students cannot read each other's scripts online (off-the-shelf firewall and access control packages should suffice); however the real problem is in ensuring that the person who has submitted the work is the student taking the course. For non-qualification based courses, this is not too much of a problem, but for courses with real qualifications given at the end, authentication is essential. It may be preferable for the students to sit their examinations under supervision, perhaps at a local Further Education college. This is similar to how established distance learning providers, such as the Open University, conduct their examinations

and, from the results observed in our survey, would seem to be compatible with the views of employers. The wider issues of security in ODL are discussed in Furnell et al (1998).

Training

The browsing paradigm and hypertext information may not be familiar to lecturers or students. Creating content according to a hypertext medium is different from creating standard linear text, and care must be taken to ensure the content is created effectively. For this, training may need to be given. Equally, getting the most out of such hypertext content requires experience, and students may require some training to get the most out of the course. As such, a small, introductory 'course' with no formal assessment can be created to guide the student through the concepts involved in hypertext navigation.

System Requirements

In order to be able to effectively use the course, the student will need to have a certain level of equipment. As previously stated, different courses may have different expectations, with higher levels providing the student with more interaction. It is difficult to precisely define system requirements, but the following represents a guide as to what can be achieved at different levels:

Basic level
Pentium-class PC, 28.8kbps modem, CD-ROM drive, 16MB RAM.
Enables: all text-based information, chat areas, newsgroups

Intermediate level
Pentium-class PC, 28.8kbps modem, sound card, CD-ROM drive, 32MB RAM.
Enables : all text-based information, chat areas, newsgroups, audio-conferencing

Advanced level
Pentium II-class PC, ISDN connection or higher, CD-ROM drive, 64MB RAM, Web Camera.
Enables: all text-based information, chat areas, newsgroups, audio-conferencing, video-conferencing

It should be noted that the technology described here is current as of November 1998. The speed with which such technology develops is such that the majority of it will be outdated in one or two year's time. As such, requirements should be reviewed on a regular basis, to ensure that they are as up-to-date as possible, as delivery expectations will also evolve.

POTENTIAL BARRIERS

Even with a workable technological approach, there remain a number of potential barriers to the effective realisation of an ODL delivery system. The core realisation here is that ODL is not just about technology – there is a significant dependency upon people (i.e. the academic staff

required to provide and support online courses) and, hence, appropriate administration and management of the approach. This section presents a number of potential problem areas, some of which were highlighted by the academic staff consulted as part of our investigation.

Time constraints

The most significant concern facing academic staff is the time required to create the online content. This is understandable in that many of them have substantial workloads already and, therefore, would not welcome the additional demands that ODL is likely to introduce. One particular concern is that time would have to be spent on formatting the content to fit into an online framework, which would detract from actually creating the content to the required academic standard. This highlights a requirement for training and assistance in preparing or converting content for ODL delivery, such that it effectively becomes automatic and transparent from the lecturer's perspective.

Unfamiliar technology

Another likely concern, although less strongly expressed by our sample group, is unfamiliarity with the core technologies involved. This would be increasingly likely when dealing with staff who deliver non-IT or technology based topics. Whilst many lecturers may now routinely prepare course materials with applications such as word processors and presentation packages, they may (quite legitimately) have had no requirement or interest in preparing web-based content. As such, they may feel intimidated by the technology and, therefore, regard this as a barrier to the whole issue of ODL. This issue could be overcome if it is recognised from the outset by the establishment involved and appropriate provision is made to support staff in the creation of their online courses (Kiang, 1998).

Undermining of traditional environment

Some observers may feel that ODL risks undermining the existing university environment, leading to a situation where too few students actually come to the establishments for face-to-face study to make the operation of the physical university viable. However, the view of the authors (which may, of course, be disputed) is that the main exploitation potential for ODL does not lie with typical undergraduate type courses, where students come for a relatively intensive period of study to obtain and develop a wide range of core skills. It is felt that the concept can be more closely linked to initiatives such as lifelong learning, targeting people who are already in the workplace and require a means of updating their knowledge.   These are people who sometimes attend the traditional university environment (e.g. for short courses or on a day-release basis), but would vastly prefer a situation in which the knowledge would come to them. ODL materials could, of course, still be made available to the wider student population, but as a supplement to traditional attendance rather than as a replacement for it.

Displacement of lecturers

Another concern is that ODL could be used as a vehicle to undermine the role of the lecturer – i.e. once all of the relevant course information is available online, it could be delivered without further intervention from the lecturer, leading to a situation where his/her services are no longer required.   Whilst this attitude *could* be adopted, it would not be particularly forward looking on the part of the university concerned. Many subjects are such that the material delivered could not remain constant from year to year and ODL content would, therefore, need updating in the same way as traditional lectures. In addition, the lack of one or more lecturers associated with each ODL offering would severely limit the opportunities for assessment (and hence accreditation of the resulting award) and advisory services. It is considered extremely unlikely that students would feel that they were getting 'value' from such an approach, unless it was for a very basic learning experience. Nevertheless, some evidence exists to illustrate the potentially negative impacts – for example, lecturers being threatened with the loss of their jobs if they did not produce online versions of their courses, and then being hired to teach the online version at a fraction of their former rate (Noble, 1998).

All of the points above indicate a need for the introduction of ODL to be handled in a careful manner, with advocates presenting clear arguments as to why the approach will benefit the university. A heavy handed approach would be unlikely to yield positive results and would be more likely to breed resistance and discontent amongst the staff. A key issue will be support – both in terms of training and awareness initiatives and adequate time provision for academics to develop their online materials (e.g. allowances in the timetables or other workloads of affected staff).   Such allowances are unlikely to be entirely within the gift of individual heads of schools or departments and, therefore, will require appropriate buy-in from the highest levels of a university hierarchy. The basic message is that if ODL is to be realised to its fullest potential, it cannot be addressed half-heartedly.

CONCLUSIONS

Online Distance Learning is considered to represent an important approach for the future delivery of certain types of courses, particularly within societies where the concept of lifelong learning is now receiving significant focus. Existing universities (and other academic / training establishments) will increasingly find themselves faced with the expectation of being able to provide such remote learning facilities – particularly in cases where they are dealing with a 'student' population that is already in full-time employment. As such, an appropriate strategy for making the transition to ODL is important, along with an appreciation of the problems that may be encountered.

The paper has outlined the technical requirements of an ODL framework at a generic level, based upon consultation with academics and an industrial audience. It has demonstrated the enthusiasm for the concept within a sample of industrial companies and their willingness to adopt it. Academic staff have also been shown to see positive factors, but their views are qualified by concerns over potential problems that could result if the issue is not approached correctly. Whilst the findings have been based upon a particular study looking at the feasibility of migrating existing courses within a particular university, it is considered that much of the information uncovered would be applicable within a wider context.

The investigative study described in the paper has now led on to further work, involving the practical implementation of key aspects of the ODL approach required. Particular attention in the next phase will focus upon the issues of content creation (with the development of an assistive tool for online module creation) and the delivery of real-time, interactive lectures via WWW technologies. These elements will be validated and trialed within the research environment, leading to the subsequent delivery of operational ODL course programmes.

REFERENCES

Allen, M., (1997), "To be or not to be? Questions of computer-mediated learning and distance education", in Strategies for open, flexible and distance education, Website, Teaching Learning Group, Curtin University of Technology, Perth, WA, 1997. http://www.curtin.edu.au/learn/DSM/examples/4.html.

Brusilovsky, P.; Eklund, J. and Schwarz, E. (1998), "Web-Based Education for all: a tool for Development Adaptive Courseware", in Seventh International World Wide Web Conference, April 14-18, Brisbane, Australia.

Carswell, L. (1997), "Does Internet Presentation Affect Learning Outcomes for Introductory Computing Students Studying through Distance Learning? Some Preliminary Results", Open University, Faculty of Mathematics and Computing, Milton Keynes, UK. http://cszx.open.ac.uk/publications.html.

Cochrane, P. (1995). "The Virtual University", Business of Education, Issue 5, March 1995: pp17-18.

Culverhouse, P.F and Burton, C.J (1998), "MTutor: a tutorial shell for supporting problem solving", in Bringing Information Technology to Education, Eurelings A (ed.), Kluwer Amsterdam, ISBN 90 268 320 60.

DFEE. (1998). "The learning age: a renaissance for a new Britain", Department for Education and Employment, The Stationary Office, ISBN 0 10 137902 1.

Educom. (1997), "IMS Design Requirements", Educom Instructional Management System (IMS) Partnership, 19 December 1997. http://mic8.hensa.ac.uk/mirrors/ims-project/req.html.

Furnell, S.M. Onions, P.D, Bleimann, U, Gojny, U, Knahl, M, Röder, H.F and Sanders, P.W. (1998), "A security framework for online distance learning and training", Internet Research, Vol. 8, No. 3, pp. 236-242.

Kiang, T.P. (1998). "IT Starts like this… An Approach to the Training of Educators Developing Learning Websites", Proceedings of OnLine Educa Berlin 98, December 2-4, Berlin, Germany, pp. 196-200.

Microsoft. (1998), "XML: A Technical Perspective", Microsoft Corporation. http://www.microsoft.com/xml/

Noble, D.F. (1998), "Digital Diploma Mills: The Automation of Higher Education", Perspectives, April/May 1998, pp. 9-14.

O'Reilly, M. and Patterson, K. (1998), "Assessing learners through the WWW", in *Seventh International World Wide Web Conference*, April 14-18, Brisbane, Australia.

Sainsbury. (1998), "Modernising Learning – The Role of the University for Industry", Speech by Lord Sainsbury of Turville at MacLaren Memorial Lecture, Aston University, Birmingham. Available from http://www.lifelonglearning.co.uk/ufi/index.htm.

Sharpe, R and Bailey, P. (1998). "Networked learning for professional development: Design and evaluation of technologies to meet learning outcomes", in Banks, S., Graebner, C. and McConnell, D. (Eds), Networked Lifelong Learning, Innovative approaches to Education and Training through the Internet: Proceedings of the 1998 International Conference (Sheffield, UK): pp3.18–3.16.