Paper 7:

Developing a Virtual College

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Summary

- This paper discusses recent research into on-line educational services designed to support lifelong learning. These services support learners working in remote or isolated environments, as well as those in traditional learning environments. The case study used as an example was a collaborative project in the FE sector managed by BT Laboratories (BTL) and Northern Colleges Network (NCN). The aim was to evaluate an intranet based service, called CollegeComplete, which offered on-line resources over the network, as well as communication tools such as audio, data and text conferencing to enhance the learning experience and support social interaction.

Strand 4: Networked Learning in Community Development

Keywords

- Information Communications Technology, on-line education, intranet, audio conferencing, groupware, web based graphical user interfaces, innovation.

Introduction

- On-line education involves more than just delivering content. Content is important because it provides learners with their first contact with other peoples' concepts, but learners also need an environment where they can test out these concepts using a 'constructionist' approach. A good educational system also needs to support 'dialogue' that takes place in both formal settings, (e.g. tutorials), as well as less formal settings. The stages of conceptualisation, construction and dialogue have provided a basic learning framework which has already helped BT to forge powerful links between pedagogy and system design [1].

  BT has been involved in a number of research projects in the educational environment, running trials using both existing products and services, and technologies currently under development. These have included trials using video and audio conferencing, and the Internet, or World Wide Web (WWW).

  One of the major findings from this research is that while the Internet is an excellent medium for the distribution and easy updating of on-line resources, its true potential is not realised if it is merely used as a one-way delivery medium. Students and teachers working in a remote locations may still feel isolated. While it improves access to resources, using the 'net' solely to deliver course material does little to support the students' learning experience. The addition of communication tools into the equation - for example text-based chat facilities, conferencing and groupware applications, can offer learners a more natural total learning environment.

Background to Project Partners

- Northern Colleges Network (NCN) is a consortium of 16 Further Education (FE) colleges in the North East region, working together to offer flexible on-line opportunities for training and education. One of the main objectives of this group is to support increased numbers of people in the North East region in developing the new skills needed to re-enter the workplace or re-skill themselves. The general objective is to promote life-long learning within the region's businesses and their associated communities.

  The NCN consortium was set up in 1996 as a result of a successful DTI Competitiveness Fund bid, and since then a number of initiatives have been put in place to improve facilities, thus maintaining and supporting the existing client base, as well as encouraging expansion. After operating as a project for two years, the company Northern Colleges Network Ltd. was established.

  NCN aims to harness the benefits of technology in the educational environment, and to enable Colleges to communicate with each other via an intranet. It aims to make effective use of collaboration between consortium members and of information communications technology (ICT) in order to support the learning process.

  The Education and Training Research programme at BT Laboratories (BTL) is dedicated to investigating new and innovative ways of learning, using ICT effectively across a network. This research has included running a number of successful field trials across the full educational spectrum. These technical and user trials are run in real environments with real users to ensure that a true picture is formed when assessing the potential benefits of using ICT to enhance and support the learning process.

  BT provided NCN with a managed intranet service, based on physical links between each college, through fibre-optic leased lines which connected to a BT point of presence (PoP) in Newcastle. This PoP gave access to BTnet and provided managed connectivity to the global internet.

Using this infrastructure, the Education Research Team from the Human Factors Unit at BTL worked in collaboration with NCN to study the use of a novel experimental Learning Platform. The focus of the research was to investigate the use of intranet based resources and communications tools to support learning in the FE environment.

The Learning Platform: The RISE system

- The RISE platform, or Real time Interactive Social Environment, was originally developed as part of the collaborative 'Merlin' project between BTL and the Language Institute at the University of Hull. RISE has at least two unique attributes [2]. Firstly, by using 'web groups' and dynamic paging, personalised pages can be presented: learners using RISE can each see their individual courseware, portfolios and student notes, in addition to viewing shared group resources. A second unique feature is the use of a web front end to launch a multi-user audio conferencing facility.

Technical Specification

RISE requires each user to have a Personal Computer (PC) with a Netscape browser (version 3.0 or higher), and a dedicated telephone line. Connection to the network can be via two PSTN lines, with one carrying data and the other voice, via ISDN2, or via a combination of LAN and PBX connections. The back-end of the system consists of a WWW server, which is integrated with an Oracle database. This communicates via a socket level connection to an Aculab Millennium CT platform. This is a PC based device, which handles audio conferencing for up to 30 people.

Users log on to the RISE system from their web browser, which then opens up multiple windows. These include static web pages and dynamic information that is customised for each user. Users are able to see who else is currently on-line and what they are doing. Key elements of RISE, described below, are the 'Meeting Place' through which users access and control multi-user audio conferencing, and the 'Portfolio' where users' work is stored and can be viewed.

Case Study: CollegeComplete

- RISE proved successful for teaching English as a Foreign Language (RISE-Merlin), but to be assessed as a truly generic learning platform it was necessary to develop and test it on further applications. A second trial involving the FE sector and a more vocational course was felt to be a good further test of RISE's robustness and portability.

Project aims and objectives

CollegeComplete began in July 1997 with the preparation for on-line delivery of a Level 2 NVQ, 'Using IT', using networked multimedia. The main responsibility for the creation of course content lay with NCN, whilst BT were responsible for the service framework and learning platform, i.e. adapting and then maintaining the existing RISE platform.

In November 1997 a four-week trial began using the RISE platform and two modules of on-line learning materials related to the 'Using IT' NVQ. The objectives of this trial were to:

- test core technologies
- evaluate the usability of the trial system developed by BTL
- increase awareness of on-line learning throughout the member colleges
- provide early indications of the acceptability of the technology for on-line learning
- investigate effects of organisational factors on implementation of on-line learning

The trial involved provision and testing of service capability, rather than a fully managed service. As a result, security only extended to simple user

names and passwords, and some essential features of a full service such as billing and course administration were not provided or assessed.

CollegeComplete System

A RISE application was tailored to the needs of NCN and designed to support the delivery of an NVQ course. This system was run alongside a groupware application, SoftArc's FirstClass Intranet Server. The combination of these technologies enabled users to communicate either synchronously or asynchronously, using both audio conferencing and text based conferencing facilities. The system interface, lying within a WWW browser, could link to both applications, and the intention was to make this integration transparent to the user.

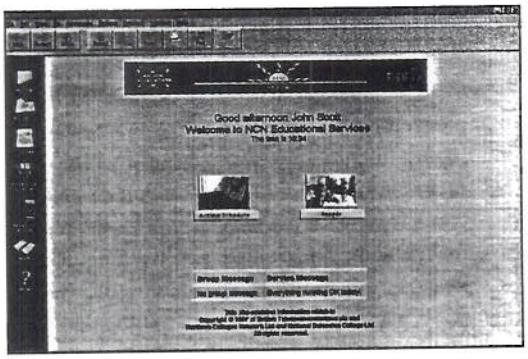

Figure 1 - the NCN Home page

Access to other relevant course materials was provided in addition to the above facilities and content. This included access to user guides based on the NEC's document 'How to complete an NVQ', supporting resources produced by NCN specific to the 'Using IT' NVQ, and system help facilities.

Meeting Place

The Meeting Place is a separate WWW browser window shown on each user's screen once they are logged on to CollegeComplete. This indicates who is currently logged on and what conversations are taking place. Users are able to initiate a conversation, or conference, with one or more users via the Meeting Place interface, as well as accepting invitations to conferences. This dialogue can be recorded and saved, either as a personal recording, for example recording a one-to-one tutorial between and student and tutor, or as a shared resource, for example a group tutorial.

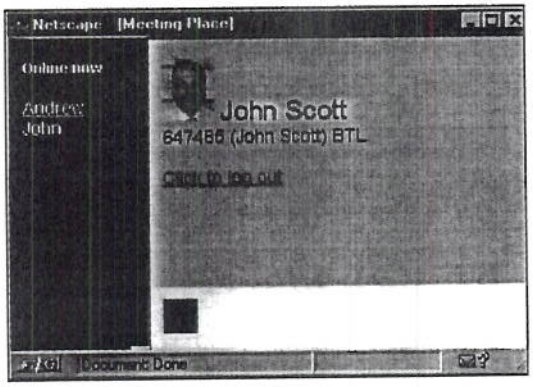

Figure 2 - the Meeting Place interface

Evidence Collection

The crucial aspect of NVQ's is the collection of evidence, and any on-line system needs to support this. Students were able to collate and store their work as audio or text, either in a private folder or in a group folder called the 'Portfolio'. This includes an index for each user indicating which files they have access to, when work has been submitted, by whom, on what date, and so on, thus allowing a full document history to be produced.

NVQ Trial

- From eleven of the 16 NCN colleges, 26 non-IT specialist staff members agreed to participate in the trial as students undertaking the relevant NVQ levels. Reasons for using members of staff from the colleges were twofold:
  - to recruit champions within each college to disseminate the concept of on-line learning within the non-IT curriculum areas
  - to trial the technology and new methodologies within the confines of the member Colleges in case of system difficulties (either technical or educational)

Four tutors were nominated from the NCN colleges to take on the role of on-line tutors. Each took responsibility for between six and eight on-line students located at a college geographically distant from their own. The lead on-line tutor had been involved in the project since its inception, and had taken responsibility for the scripting of material converted for use during the trial.

Trial Outcomes

- At the end of the four week trial period almost three quarters of the students had successfully logged onto the CollegeComplete system, and over a third of this group had begun the NVQ practice exercises and/or gathered evidence towards their NVQ. These will be referred to as full users. The remaining students in this group, who despite using the system regularly did not try a practice exercise or gather any NVQ evidence, will be referred to as partial users. Other students encountered difficulties logging on to the system for reasons described below. These users who either did not access CollegeComplete at all, or logged on less then twice are referred to as non-starters. All four tutors successfully logged on to the system, and used the CollegeComplete functions to support their role as on-line tutors.

Technical Issues

Equipment levels and set up

The non-starters mainly attributed their lack of participation to technical or set-up problems within their colleges. In addition, other students who were successful in accessing the system during the trial also reported experiencing technical problems within their colleges.

The most common problems reported related to the college network / firewall, the absence of direct dial telephone lines (DDI) in some of the colleges, difficulties encountered by technical support people in setting up computers, and a lack of technician time. Further problems were encountered in cases where the equipment available in the colleges did not meet the required specification.

Only a short time was available to prepare for this trial. As a result, NCN were required to quickly translate the overall requirements specification for the equipment into specific local actions at the college level. This meant that some of the students and one of the tutors did not get access to the system until the third week of the trial.

Despite these issues, three quarters of the students who were questioned, both full and partial users, reported finding the level of technical support they received during the trial to be "acceptable".

> "project system worked well or was quickly sorted by my college technical staff"
>
> *(Full user's response in post-trial questionnaire)*

Feedback from the students and tutors suggested that the level of technical and management support received by the users varied according to college. In some colleges NCN was well understood by many of the staff, and the management openly supported staff participation in the trial. However, in other colleges, students suggested that their involvement was maintained solely through their own interest in the trial and / or the technology.

System performance

One of the main aims of the trial was to test how well the experimental RISE platform performed when used as a component of NVQ delivery within the FE sector. Almost half the students and all the tutors reported that the system had performed well. Only a quarter of participants reported any problems they classed as 'unacceptable' in respect of system 'crashes' or 'time-outs' encountered with the experimental platform. As a result of feedback gained during the trial, the BT team were able to test and improve the robustness of the system to further improve user acceptance as the trial progressed.

User perspective

Over 80 % of students questioned felt they had benefited by taking part. A significant number considered the trial to be of real benefit in terms of developing their ICT skills and their knowledge of the internet.

> "I have a better understanding of the internet etc. and this will be useful for my job"

and

> "...some knowledge of e-mail and the Internet..."

(Partial user's response in post-trial questionnaire)

In addition to these specific applications, students' motivation levels increased as they found the system easier to use, and many expressed a desire to continue using ICT as both a teaching and a learning tool in the future.

> "I had more motivation to do work on the computer and try to solve problems. It helped me get on a faster learning curve"

(Full user's response in the post-trial questionnaire)'

Using teachers as pseudo-students in this trial was of benefit to all participants. In particular it enabled the tutor to understand the requirements of a student when working remotely and / or using ICT to support this learning process.

> "It was interesting to see how the system worked and I enjoyed experiencing things from a student's point of view"

(Partial user's response in post-trial questionnaire)

However, despite providing positive feedback about the learning gains associated with the experience of networked learning, many students gave negative, but constructive, feedback about their actual experiences. A number of the students reported feeling confused about what was expected of them from before the start of the trial.

> "There was still general confusion after the induction meeting.... I felt we needed a second overview with more detail about the course"

(Partial user at a focus group)

Two thirds of the students who were questioned reported that the amount of information they received from their colleges on how to use the system could have been improved. When asked about the NVQ course itself, two thirds of the students reported that the amount of information they received was insufficient.

> "...my tutor was very supportive, but I needed more of an overall picture of what we were trying to achieve..."

(Partial user's response in post-trial questionnaire)

Of the students questioned, full users reported participating in almost twice as many on-line tutorials as partial users (approximately four, as opposed to two). In one case where the tutor held almost twice as many tutorials as in other groups, (16 in total), twice the number of students had the motivation to become full users. These results suggest that the level of interaction, and the amount of support received when working on-line are critical success factors.

An interesting difference emerged between students' perceptions and actual achievements in the trial: in a number of cases, although they were in fact making very satisfactory progress, they still reported that the experience of the trial had not been as positive as they had hoped.

Conclusions from the trial

- The usability results clearly showed the importance of managing the expectations of the tutors and students before the trial. Other usability problems could have been reduced by, for example, producing simple 'quick reference guides' for the students.

  The level of support required for both on-line tutors and students was under-estimated, and this led to a number of problems as discussed above. It is apparent from the tutors' feedback session that they were unaware prior to the trial of the amount of time and commitment that would be involved.

  Similarly, students reported feeling unsure of what was required of them during the trial. In an induction meeting prior to the trial it was suggested to the students that they should have completed four elements of the NVQ at the end of the four weeks. Although some of the students did begin NVQ exercises during the trial, the majority did not start any exercises, and even those who did said they felt unsatisfied with their progress. However, this may be attributed to the fact that users were unfamiliar with the novel medium used, and were also unfamiliar with the course content. In addition to this, not all students were experienced in taking control of their own learning.

Implications from trial

- There are a number of tentative implications arising from this small-scale research project. Some are specific to the particular project partners while other more general recommendations can be made which may apply to any organisation considering the implementation of on-line education and training packages.

On-line tutoring

A tutor's commitment to on-line learning, and knowledge of IT is crucial. Implementation of an on-line education and training package will not remove the need for a tutor, but it will have an effect on their role as a facilitator. Tutors must be committed to developing and undertaking a new style of support, including on-line one-to-one and group tutorials. In this trial the tutors were still committed to their existing traditionally taught curriculum and found that these time constraints were a barrier to success as an on-line tutor. In addition to this they frequently had to take on a technical support role. In a traditional learning environment, extra technical support would be provided. Naturally, with an on-line system the need for this support is increased.

On-line learners

There are a number of critical success factors for the student when undertaking an on-line course. The first to be highlighted from this trial was that of providing on-line support. The students in the trial were from a variety of academic backgrounds spread across a number of colleges. They had varying levels of IT experience and different levels of equipment. There was an assumption that all students would need the same level of support and time to familiarise themselves with the new system. These needs turned out to vary greatly across students: in future work an important early step could be an assessment of each student's technical ability, together with an initial training session.

> "If learners cannot relate to the new concepts then they will always remain distant and probably misunderstood."
>
> *Fowler and Mayes, 1997 [1]*

Students also need to be aware of the level of commitment and self-motivation required. Again, this expectation should be carefully managed through an early meeting between student and tutor.

The technical difficulties students encountered during the trial were understandably a barrier to success. This was partially due to the experimental nature of the system, but was also due in part to disorganised or over-complex problem reporting. A three-level hierarchical model for problem reporting was in place, but was rarely used. Students should instead simply have to report a

system problem to their tutor or college technician and should not have to take on the responsibility for directly contacting external bodies.

Organisational issues

The CollegeComplete trial was a success in terms of identifying a number of critical success factors for NCN, or any other educational establishment implementing an on-line learning application.

The senior management or teaching staff in a college clearly have to be committed to using technology. In addition to their buy-in, they need a motivated champion in the college and the supporting ICT team. This trial demonstrated this model, as the lead tutor took on the responsibility of training other tutors and in turn motivating them.

An essential team member is a dedicated technician. Non-teaching staff who have the technical expertise and also the time to properly support ICT should take on this role. In-service training is essential for the ICT team, and the skills, which are developed, should also be disseminated through the college.

Once all these processes are in place, the key to successfully delivering education using this technology is communication. Not simply downstreaming information though an individual institution, but sharing information and resources across a network of stakeholders.

Technical Issues

Overall the trial CollegeComplete system was a technical success. However, to be used effectively in the learning environment, the technology should be more transparent to the user. A student may pick up a fountain pen and write with it, but would not ordinarily question why. They know a fountain pen is simply a tool, which contains ink and will enable them to write. In much the same way, for these computer applications to be used effectively as a learning tool, users should not question why they are accessing the system, but simply use the tool to carry out the task.

Future research

- The CollegeComplete trial addressed only one type of course using one topic as an example. However whilst this may appear to be a relatively restricted scope, a number of recommendations can be made with regard to on-line learning within the FE sector. In addition to the issues highlighted in the previous section, the following areas need to be addressed:
    - increased functionality of the system to include options such as on-line course registration and enrolment, on-line billing and student record systems and awarding body assessment and examination capabilities
    - publishing facilities, capability and appropriate tools to allow easy generation of on-line materials
    - more research into different applications of the technology in order to research the feasibility of remote access to the platform and true flexibility in terms of tutor availability
    - research into mainstreaming of the technology to different curriculum areas involving a greater range of on-line tutors
    - the concept of the educational mall and a brokerage system to allow the National Grid for Learning and the University for Industry to reflect true virtual centres of education

The following areas require further research to fully examine the wider opportunities available when using ICT to support ever-changing learning environments:

- ICT - what is feasible in terms of bandwidth and usability
- new skills - what implications are there for an on-line tutor?

- logistics - the student and tutor can now be anywhere, but this needs to be managed
- student support and welfare - of prime importance to ensure the student succeeds and feels part of a community
- security of the system - in terms of billing and awarding body approval
- creation and maintenance of multimedia content - use of existing material versus in-house creation of content
- collaboration - between education and industry

Government policies regarding education and life long learning reflect the need for the use of ICT to increase participation in learning and enhance the learning process. Whilst research into the use of these technologies and production of content in a format suitable for on-line delivery is essential, it can be both time consuming and expensive. Only by working in partnership can we achieve all of our respective objectives in this area. The collaboration of the colleges working within the Northern Colleges Network, coupled with the work of this consortium with industrial partners such as BT, provides a good model which could help to meet the challenges facing the FE sector over the next few years.

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