A New Library Consortia: a view from Ireland

Ann Cleary and Charlotte Rowe
PK 7, Institute of Technology

1 Introduction

The MIS (Management Information Systems) Project, is a national initiative installing a common Library and Academic Management system in fifteen Institutes of Technology in Ireland. Its role is to manage the selection, implementation, and development of software installations in key business areas. These areas include student registration, personnel, financial administration and library management. The Institutes involved in the MIS Project, through an MIS Project Consortium Board (and a previous body called the Project Steering Committee), control and govern the MIS Project. All Institutes involved in the MIS Project are represented on the MIS Project Consortium Board. As with all projects, the MIS Project is a one-time unique opportunity to do something that has not been done before, within specified resources, constraints and objectives.

Recognition of the need to build on the advantages of commonality is an underlying reason for adopting a centralised approach to the implementation and development of these software installations. The MIS Libraries Project provides centralised management services for all of the implementations in Institute Libraries. The Project offers a complete solution for the Institute Libraries from software and server hardware acquisition through to training and implementation resources. It has also devised an implementation plan and methodology to assist Libraries.

The Institutes are geographically dispersed but share a common legislative framework. The MIS Project began in 1993 and is funded by Ireland’s Department of Education and Science. The member Institutes come from diverse backgrounds, are often in competition with each other and do not necessarily share common ambitions. All are governed by similar legislation and government policy which focuses their work on the delivery of technically oriented training. Institutes were originally called Regional Technical Colleges. The early Colleges were founded in the late 1960s and were managed by local educational boards. Legislation in the 1990s conferred autonomy on the Colleges in relation to the management of their own affairs. Because of the nature of their training, Institutes have been credited with providing the workforce competencies that have fuelled Ireland’s oft called ‘Celtic Tiger’ economy.

The common legislative framework inaugurated in the early 1990s has provided a potential framework for the development of common approaches and policies. In this regard the MIS

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1 The Institutes of Technology are Athlone, Carlow, Cork, Dublin, Dundalk, Galway-Mayo, Letterkenny, Limerick, Sligo, Tallaght, Tralee, Waterford
Project is a pioneering example of co-operation and collaborative decision making. The use of a common software platform offers many opportunities to enhance co-operation and collaboration. Unlike other co-operative ventures, the MIS Project requires a level of practical and on-going decision making which affects policies and work practices at individual institute level. The impact of software installation and development using a common approach therefore requires the implementation of agreed policies and changes in work practices. The MIS Project consequently is more than a software installation project and could be seen as a community development and change management initiative.

The Libraries of Institutes reflect the general practices of the sector. While the Librarians of the colleges have met regularly, such meetings were not until recent years focused on collective decision making or co-operation. Individual staff are not necessarily aware of their counterparts in other Libraries, of common problems or of practices. Furthermore, there has not been any analysis of the collections of individual Libraries to assess strengths of collections or degrees of overlap. Inter-lending is limited with most inter-library loan requests directed to the services of the British Library in the UK. Most of the Institute Libraries are small with stock levels ranging from 3,000 to 130,000 items. Staff numbers range from 3 to 75. Because the MIS Project had a long gestation period the Libraries have also had little opportunity to assume ‘ownership’ of the project until recently.

The Institute Libraries are not unusual in an Irish context where despite our small size Libraries have generally low levels of co-operation and interconnectedness. Librarians have adopted a user/service orientation, which challenges traditional isolationist practices. UK-based research indicated ‘. . . the present rigid vertical structures between public libraries, university libraries, college libraries, the libraries of professional bodies’s etc. do not reflect the way in which users actually manage their information. We have created a world which assumes that users “belong” to a single sector, despite the emerging evidence to the contrary from such research as the BLRIC-funded People Flows Project.’ 4 Furthermore, the economic capacity of Libraries to go it alone is seriously doubted. Spies notes that ‘We’ve moved from a world where everyone wants to go it alone to a world where you can’t survive unless you have lots of allies. Given the enormous costs involved, the uncertainty of outcomes, and shortened product life cycles, libraries must pool resources . . . Co-operation and inter-dependence are pre requisites for survival’. 5 In Ireland these views are echoed in a recently published national policy on Irish Libraries. Joining Forces: delivering Libraries and Information Services in the Information Age states that it is not feasible or viable in this Information Age for any one library or information service to satisfy all its users from its own resources, and that Ireland needs to take a global view in order to satisfy local needs. Its vision statement says

4 Derek Law Keynote address Working Together: Covering the Nation’s Resources: seminar organised under the auspices of the British Library’s Co-operation and Partnership Programme, LASER and LINC online document; available at http://www.bl.uk/concord/public1.html

The vision for the 21st Century is of libraries and information services in Ireland cooperating to provide universal access to information and resources that enrich the cultural educational, social and recreational lives of Irish people. The national policy document was launched in Spring 2000 and had yet to produce any practical initiatives.

2 Background to the MIS Project

One of the effects of the 1992 legislation is that the Institutes are directly responsible for the management of their own affairs and certain managerial functions formerly discharged by Vocational Education Committees on behalf of the Colleges (particularly in the areas of payroll, financial management, budgetary control, accounting and personnel) are now discharged directly by the Colleges, in addition to the managerial functions and services which were discharged by the Colleges heretofore. The accounting and financial management and control systems for the Colleges have also been revised following the introduction of this new legislation. Three new colleges have been established in the sector and these too have become part of the MIS Project.

The Institutes of Technology are recognised as having made a significant contribution to Ireland’s economic development. The model of full time course provision to school leavers however is likely to be replaced by a new one characterised by diverse learners, year long activity, social inclusion, stronger links with industry and a multi mode of delivery. Institutes are also responding to the skills shortage experienced by our growing economy. The MIS Project is a key structural requirement of Institutes if they are to respond to these changing circumstances.

Within Libraries technology has had enormous impact on the delivery and accessibility of information. Libraries, their practices and services are in the process of being transformed by these developments. The levels of complexity associated with current information provision are such that Libraries require sophisticated information retrieval and management software, which facilitates end-users but also, prompts Libraries to review their practices in the light of changing user requirements.

The new Library system selected under the MIS Project will

- Facilitate modular learning and new training and education delivery models
- Support the development of resource sharing infrastructures
- Empower Libraries of Institutes to offer better services to their users
- Support staff of Institute Libraries in their delivery of services
- Support the development of common standards
- Enable the development of physical indicators to measure the effectiveness of services and practices
- Keep pace with and respond to changing technological and service provisions

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6 Library Council, **Joining Forces: delivering Libraries and Information Services in the Information Age** (Dublin, 2000)

7 Colleges have been established in Blanchardstown in North Dublin city, Tipperary and at Dun Laoghaire in South Dublin.
– Provide Institutes with maximum capacity to use new information delivery platforms

Institutes are also aware of the advantages offered by integrated systems in decision making and effectiveness. The potential of a common system which could address the needs of all business areas was initially given serious consideration in the selection process.

3 System Selection and Project Framework

A Joint Study Group, comprising the Regional Technical Colleges, the Dublin Institute of Technology and the Department of Education was established in 1993. In May 1993 it issued a Request For Proposal (RFP) for the supply, under a fixed price contract, of consultancy services to carry out the development of specifications of user requirements and Invitation To Tender (ITT) as the first stage in the Project. One firm was awarded the contract to undertake the work specified.

3.1 This stage of the Project was undertaken in four phases

– Analysis of Current Situation
– Specification of Requirements
– Completion of Strategy and Plans
– Preparation and Issue of Invitation To Tender

The four phases were successfully completed by June 1995 and involved a very high participation rate from all partners to the Project. The Joint Study Group was dissolved. A Project Steering Group was then established to oversee the next stage of the Project and they appointed a full time Project Director. This new stage of the Project involved placing the ITT in the European Journal, with tenders being received in late 1997. The ITT sought tenders for software to standardise the Management Information Systems in the following business areas:

– Student;
– Course;
– Personnel;
– Finance;
– Executive Information System (EIS)/Strategic Management;
– Research and Consultancy;
– Physical Resources and
– Library

Tenders were evaluated in the first six months of 1998 by a team representing key functional areas within the Institutes. These teams worked within an overall agreed framework to evaluate the offerings of suppliers. It soon became apparent that no single system met the functional requirements of all business areas. Because of the time commitment required

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8 The Dublin Institute of Technology is the largest Institute with campuses spread across Dublin city.
and the levels of complexity which had to be assessed, the evaluation team divided into a Library software evaluation team and a team which assessed other business areas. The evaluation team for the Library system included Librarians, a Systems Analyst, a Director of an Institute, a Lecturer, and the Project Managers.

This team recommended the purchase of Millennium Library system from Innovative Interfaces Inc (III). This software offers an integrated solution for the Library functional areas and was the product which best met the Institutes’ criteria. III are market leaders in Library systems and have a strong customer base worldwide. SCT’s Banner system was selected to address the student administration and financial areas of operation. The Project Steering Group endorsed these recommendations.

The MIS Libraries Project has a responsibility to manage the overall implementation at the fifteen participating Libraries. It provides skills in project management and has created functional teams composed of personnel from Institutes to lead the implementation process in business areas. At individual sites implementations are managed jointly by the staff of the Institutes, the MIS Libraries Project Staff and the staff at III. This requires considerable planning and recognition by participating Institutes of the implication for others of events at a single site. The MIS Libraries Project central team has devised an agreed implementation methodology and process. This is crucial to the success of the Project.

The term implementation as used by the Project, refers to a series of events that occur when an organization changes its current ways of doing a particular task in a new way. It is frequently used to define the process that occurs when you begin planning the installation of new software. However implementation is just one part of the entire Project process. A second major facet to the process is the development of the common implementations of Millennium when the Institute Libraries will be able to maximise the opportunities and gains offered by the use of common software across the sector.

In 2000 Directors of Institutes of Technology agreed to a Consortium Agreement which changes the decision making structure of the Project. The Consortium Agreement is a statement of commitment and agreement to proceed in a co-operative ethos to ensure that maximum benefits are obtain in terms of functionality and effectiveness from the implementations of common software systems across the Institutes.

4 MIS Libraries Project Definition

The MIS Libraries Project definition is made up of the vision, mission, objectives, benefits, decision-making structures, planning processes, implementation procedures and its development plan.

It is intended to implement Millennium at each Institute in such a way as to maximise benefits for the site in using a system common to the Institute sector. The success of the Project overall requires a commitment to and vision of integration systems to produced benefits to users and stakeholders.

4.1 Vision and Strategy

The development of specifications for systems in 1993 involved a degree of visioning but given the time lag involved and other issues it was recognised that an agreed vision
and strategy statement was needed to progress the MIS Libraries Project. Articulation of the vision of the MIS Libraries Project has now been articulated in a Project Charter. A representative grouping of Library and MIS Libraries Project staff devised the Charter and they articulated the vision as follows:

The vision of the MIS Libraries Project is to enable and empower the Institute Libraries to deliver high quality services to our research and learning communities.

The Project will establish Institutes as models of excellence for the Irish Library profession.

Our communities will receive exceptional services as a result of increased co-operation, resource sharing and universal access to a wealth of knowledge.

The profile and value of Library staff will develop as opportunities for gaining experience, learning, training and participation in national and international networks.

The Charter also states that the Mission of the MIS Libraries Project is to enrich the services, collections and resources available to Institute communities and to offer new opportunities to the Libraries of the Institutes to develop.

4.2 Objectives

The objectives of the MIS Libraries Project have been defined as follows:

– To promote noticeable benefits to the learning communities of the Institutes.
– To promote collaboration by encouraging the sharing of resources and expertise between Institutes.
– To establish a union catalogue.
– To support the missions of Institutes in their objectives of delivering education and training in the Information Society.
– To support Libraries of the Institutes in their role on policy formation at Institute and national level.
– To formulate appropriate policies.
– To comply with all existing and future state policies on Libraries.
– To contribute to the Irish Information Society by enhancing access to information.
– To promote the position of Institute Libraries in the Information Society.
– To provide data which assists in the evaluation and review of services and which in turn enhances the quality of services available to stakeholders.
– To formalise the sharing of resources and collaboration at regional and national level.

5 Implementation Plan

Implementation is based on a progression plan, which sees sites move from responding to a Pre-Implementation Task List issued by the MIS Libraries Project to sign-off on core module implementation. Typically implementation of core modules takes one year. Core modules have been identified as:
Progression to implementation requires a site to put in place a Library Implementation Team. It is recommended that this team contains Library, Computer Services and other Institute staff. Each site is also required to have a Project Sponsor who is a senior manager at an Institute and whose task is to co-ordinate the Banner and Millennium implementations at a site. Within the Library a Team Leader is appointed who acts as the liaison and manger for the Library’s implementation of Millennium.

Once scheduled by the MIS Libraries Project to implement, the MIS Libraries Project and III will issue an Implementation Schedule and allocate resources. Crucial dates are Testpac sign-off and going live with core modules. Once a version covering the period up to Testpac sign-off is agreed, deviation from it will result in major disruption to that sites implementation. In accepting a schedule all parties undertake a responsibility to adhere to it, otherwise opportunities are lost for the individual Library and also for the other Libraries involved in the implementation. The MIS Libraries Project offers guidance, issue documents and factsheets and co-ordinates an implementation. A critical success factor in implementation is ensuring that Libraries are supported by their Institute in doing an implementation. Support in the form of additional staffing resources, capacity to attend MIS initiated training and meetings and the availability of other Institute resources, especially from Computer Services is specifically identified as crucial in documentation issued by the MIS Libraries Project. Support is obtained by the insistence of the Project that key documents including the Pre-Implementation Task List is signed-off by an Institute Director, who is usually the Institute’s sponsor for the Project and a member of the Consortium Board. In the course of an implementation Libraries and other stakeholders regularly meet and have the power to draw the attention of the Consortium Board to issues and problems, which require resolutions.

Apart from the initial installation phase the Project also involves a developmental phase. Its concerns are:

- To maximise to the full potential implementation of each module of Millennium at a site so that the Library avails of best practice, current theory and policy, delivers better services to users and attains its objectives.
- To maximise the opportunities offered by use of a common Library system, to identify and share common tasks, experience and knowledge, to provide access to resources and share them.
- To maximise the opportunities offered by implementation of common software in key business areas of Institutes, thus supporting a sectoral approach to access and to the delivery of education and training.
- To create structures, practices and processes which allow for and encourage support for collaborative work and common strategy.
Development will be an on-going process and will continue beyond the life of the implementation. A structure, which acts as a catalyst for change and which expedites change, is a key requirement for development. A key approach will be a realisation of the benefits of commonality, a willingness to cultivate and share resources and expertise regionally and nationally and a commitment to finding new solutions and methods of problem solving.

Specific solutions and approaches to the integration of the Banner and Millennium software are also required. This means that Library staff need to be involved in key policy and practical decisions. At this stage of the Project a number of areas of integration have been identified. These are the loading of Library Patron information, exchange of statistical data, exchange of financial information, holding of text i.e. examination papers or course notes. A definition of where data should originate in relation to these processes is also required.

6 Progress to date

Implementations of the Millennium system began in Spring 1999. As of February 2001 four sites have implemented all core modules, one site will have reached this stage by May. A further six sites are at various stages of implementation. Once core modules are implemented sites have to address the integration of the Millennium system with existing Institute systems, particularly for student and financial data. One site is experiencing a simultaneous implementation of the Millennium and Banner systems.

Apart from core modules the MIS Libraries Project has also purchased additional value-added software such as an E-Reserves module and personalised portal for WebOPAC and information management. As yet none of these modules have been implemented. A strategy for doing so is urgently required. Furthermore the installation process has, contrary to the expectations of sites, initiated an on-going process of change and software improvement as represented in new releases.

Sites are responsible for the on-going installation of new releases. The MIS Project however puts in place additional training and workshops which aim to encourage and facilitate sites to obtain an on-going learning and training process which enhances the overall effective use of the modules implemented.

7 Implementation Strategy

The availability and adoption of standards in relation to bibliographic and other data within Libraries means that little pre-configuration of the Millennium system is required. This has allowed the Libraries aspect of the MIS Project to advance rapidly to its current position.

Initially sites were selected to implement the system on the basis of how easy it was for them to migrate data from their existing systems.\footnote{For instance Urica, Horizon and Dynix as well as proprietary systems} Institute Libraries used a range of systems and held data in either UKMARC or non-Marc formats. After the first three initial migrations a new approach was adopted whereby sites indicated their state of readiness and Institutes expressed a preferred start date. State of Readiness is determined by a response
to a Pre-Implementation Task list issued by the Project. This is ‘signed-off’ by the Institute Librarian and the Director of an Institute. Once the MIS Project is satisfied that the site is prepared for implementation and has resolved any outstanding issues, negotiations begin with III to book the required resources from them. III assign a trainer, an Implementation Consultant, a Technical Implementation Consultant and a Project Manager to each site. The MIS Libraries Project liaises with all of these personnel on an on-going basis.

As the Banner implementations are now being rolled out, following a pre-configuration process, future implementations will have to take it into account. It is assumed that all fifteen Libraries will have implemented Millennium by 2003.

8 Change Management

The MIS Project may be viewed as a software implementation process. Such a view ignores the evidence and experience to date that an implementation process is also a change management one at micro and macro levels.

In relation to the MIS Libraries Project change is initiated by calling new roles into being within the Library where each implementation, is led according to MIS Libraries Project specifications, by an Implementation Team Leader. The Implementation Team leader is not necessarily the Librarian and takes on the role for the duration of a site’s implementation. The Project also places the Library centre stage and affords it an opportunity and a challenge to manage a large project. These imperatives therefore often produce changes in the way the Library is viewed and increases the confidences of those involved producing long term benefits for the Library and the Institute.

Change is also produced by overturning existing power-relations within Libraries and Institutes. A new implementation removes all existing orders based on ‘knowledge’ of a system and brings everyone to a common starting point. This can be a very disturbing process for all involved and calls for intelligent management. Within Institutes an implementation can take place with minimal but clearly pre-defined inputs from other Institute personnel, such as Computer Services. This means that there is a level of clarity around roles and responsibilities, which is beneficial to the Library. Furthermore the MIS Libraries Project Charter calls into being an Issue and Problem Resolution Procedure which can be used to highlight issues and initiate accountability.

Because the Millennium software offers new functionality and disrupts existing workflow it initiates micro level changes in practices. Furthermore movement towards obtaining the benefit of common implementations requires Libraries and their Institutes to assess and perhaps change their strategic directions. Moving from a site-specific focus to one which looks at the sector in totality thus can call into being a cultural shift in attitude and practice.

It is not surprising therefore that the MIS Libraries Project encounters levels of resistance. This can take the form of ‘protecting’ existing practices, avoidance, refusal to become involved, scare mongering, and postponing decisions.
9 Collaboration and Co-Operation

All involved in the MIS Libraries Project recognises that it offers a once-off opportunity to share resources and deliver enhanced services to users based on collective strengths. The availability of common software and implementation strategies enables this but policies and practices also need to change if the goal is to be attained.

Each Library determines its own collection policies, loan practices, inter-library loan facilities and bibliographic control/cataloguing procedures. Each of these areas are approached rightly from the point of view of local needs. With the MIS Libraries Project sites are asked to risk these practices in favour of the potential offered by collaborative actions.

Initially there was very little discussion on these issues but in recent months the dynamic of the Project has changed. There is now a real and open debate on the value of co-operative actions, which reveals concerns common to many consortia. These concerns include the ‘myth’ that larger Libraries will carry the burden of any resource sharing, that their collections will be ‘raided’ and their staff burdened. This area has been subjected to considerable research internationally. Sites are also grappling with the possibilities of staff exchanges and placements. Another significant area, which requires a decision, relates to the creation of a Union Catalogue. The MIS Libraries Project Charter calls for the creation of this but as yet no decision has been made on whether a physical or distributed union catalogue is acceptable. Recently the Project has initiated a number of Working Groups, which are looking at Cataloguing practices, and the issue of a Union Catalogue. They are expected to issue recommendations in April.

In general, true co-operation will require leadership and a change in emphasise which looks beyond the needs of local sites to the strategic benets of co-operative actions. A Project such as ours is however a once-off opportunity, failure to take key decisions will result in a loss to the Institutes which can not recovered easily. Decisions can frequently not be postponed and may have to arise from conflict rather than consensus.

10 So what’s going to happen?

Divining the future outcome of this Project is difficult. Mid way though its life span it is possible to make some observations.

It is becoming apparent that despite its designation and structure, the MIS Project is a Programme Office containing several on-going projects rather than a single one. We need to specify aspects of these projects and focus on their implementation, while at the same time putting in place a process which results in the taking of decisions necessary for development and strategic advancement, their implementation and progression so that the over aims of the programme can be attained.

A Project is a once-off opportunity; neither Institutes nor those involved in its implementation necessarily have experience to inform the process we are engaged in. This means

that sites and the Project can be ill informed and badly prepared for the implementation process.

The successful implementation of the MIS Libraries Project requires leadership, vision and co-ordination. These skills are not necessarily available, and while they may be cultivated over time, their delayed availability may adversely affect the Project.

A project such as this requires courage and a willingness to take risks. The mantra for this type of Project is not necessarily available or known to stakeholders. Ideally all participants are open to the possibilities and risks involved and assess them in a timely and effective manner.

Power is operative at all levels of the Project. Traditionally power was exercised by withholding information. This results in Libraries not being involved in key decisions or aware of Project related initiatives. This in turn results in lack of ‘ownership’ and resistance to the Project.

11 Conclusions

Machiavelli wrote ‘There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things’.
New technologies for a multimedia project: 
the virtual reconstruction of the Ancient Rome in the 
fourth century A.C.

Gérard Jean-François
Université de Caen

Preface

There has been a tremendous evolution in the field of technology, at the University of Caen (www.unicaen.fr), as in many other universities. I will briefly talk about this, in order to make you perfectly understand how we reached the present situation.

When computer centers were created, they were dedicated to program and make calculation only. On another hand, other services were in charge of the audiovisual areas, printing works, networks and so on... In the mid eighties, with the emergence of office automation and networks, the French Universities had to recognize the importance of the « Centre of Computer Resources », and the border between data procession and other technologies was not as clear as it used to be. The same kind of evolution happened in other fields. Nowadays, the PABX (Private Automatic Branch eXchange) use computers and the printing industry does the same with many different software packages.

The virtual reconstitution of ancient Rome is an excellent example of the evolution of such technologies. The University of Caen already had a 70 m² scale model of Ancient Rome, that is 11x6 m. We decided to develop it and make it stand out with the help of new technologies. The result is excellent and four other multimedia projects are now in progress. The common thing between them is a multidisciplinary approach, and their main objectives are to help people in their research and develop an educational and a mediatical side.

URL of the multidisciplinary consortium: www.unicaen.fr/rome/

1 A brief panorama

When you start such a project, you are soon overflowed by the huge amount of information you have to deal with. I am going to describe you the different steps which have led us to the realisation of the project.

– First of all, we had to consider that Rome was, and is, international. As a matter of fact, thousand people are interested in Rome, and the specialists of the city are numerous.
– Secondly, as far as Rome is concerned, any kind of information can be involved. It can be geography, architecture, mechanics as well as meteorology, literature...
– Then, information exists under many forms:
  • maps and plans,
  • drawing and sketches,
texts in various languages,
- contemporary photos and slides,
- photos taken from the satellites,
- scale models,
- bibliographical references in different languages,
- etc.

Last, but not least, some of these sources are sometimes mere speculations or hypotheses. As a matter of fact, archeology is a science, always in search of experimentation and the new technologies are extremely useful to answer many question, thanks to simulations.

As you may see, the project is complex, and in order to face its various facets, we decided to focus on some points which are the following:

- First of all, every piece of information must be checked by scientists.
- Afterwards, other specialists have a closer look on each of them and include them in some parts of the city to see if they are relevant.
- For instance, when a willing specialist is in charge of a monument, he gathers any kind of information he can find; if he is not sure of his results, he argues with his colleagues. In the end, they venture a hypothesis.
- The project is very evolutive and sometimes brings us to make some realizations intended to complete the architectural reconstructions, so we reconstituted the mechanisms which allowed to spread out a velum over the Coliseum, and the virtual realization of various lifting machines allows to explain the construction of buildings.
- Of course, the main objective is to digitize every piece of information.

Now, all the collected data are going to be treated.

2 Data processing

2.1 Digitization

As we have seen, information comes under many forms and each kind requires its own way. If there is no problem with the digitization of photographs or slides, it is more complex with huge plans or inside photographs of scale models.

In this particular case, we need a large scanner, or an endoscopic and digital camera. Some of the pieces of information already exist under a digital form, but in some cases, the scale is not good, or the centring does not suit.

2.2 Modelling

This is the next step and it consists in studying each part of a building, and finding its main features and resemblances. If there are many columns in a temple, each one has a base, a shaft and a capital. The point is to make them stand out, and repeat them if needed.
These operations are realised with specific computer programs, which help to build a frame, the so-called « structure in wire ».

Up to this point, the building is made of hundreds or thousands of facets, which need Mapping with different materials such as tile, marble or wood. The materials usually come from real photographs or computer-generated images.

The last step is a matter of lightening in order to have a proper highlight. In fact, you « just » have to set carefully the light and take into account, not only the position of the building, but also sunlight which varies from one hour to the other, and from one season to another.

2.3 Animation

Once the virtual reconstruction has been done, it is possible to animate the series of images.

Two possibilities exist:

- on one hand, you can organize the visit,
- on the other hand, you can let the visitor choose his own way.

That is the real virtual visit. Of course the latter is the best but it is also the most difficult to realize because every and each image has to be processed in real time. That operation requires a powerful processor.

Moreover, other elements are essential in this operation, such as a Geographical Information System (GIS) which links different sources of information, like chronology or different themes...

It is also important to have a data base to deal with the text, images, video, sound...

The following techniques are usually used in that process :

- word processing,
- vectoriel treatment,
- image treatment,
- video processing,
- sound processing,
- documentation analysis.

People who work on that field are :

- computer graphic designers,
- documentalists,
- audiovisual specialists,
- geographers,
- architects,
- town planners,
- computer scientists,
- jurists for copyright’s problems.
3 The different means of communication

After being checked by scientists, these elements form an important database which will be used in research, pedagogy, but also in the media. First of all, information will be printed, and also spread thanks to the videos, CD-Roms and Internet. Every means can be used for a lecture.

If the printing is used in magazines, masters and theses, the videos are made for a larger audience, who can see how Rome was in the fourth century, thanks to the virtual scenes. The first educational CD-Roms were published by the Presses Universitaires de Caen. Before anything else, it was made for teachers or the general public. That does not mean a lack in quality. It is exactly on the same level than others.

As for Internet, important progress have been made thanks to the creation of the W3 server in 1996. Nowadays, the data throughput is much more rapid. But, if we get excellent results as far as quality is concerned, the size of information needed is too important, especially for the visual scenes. In fact, we have to find a means which will keep the quality of images and improve the speed of the Internet Services Provider (ISP).

As far as research is concerned, it is a different matter. The University of Caen is linked to RENATER, the national research network. For its part, RENATER is linked at a wide flow to other European networks, like GEANT. From a local point of view, thanks to local authorities, every school uses Internet and has a direct access to the W3 server. We have been asked to make a copy to get another educational CD-Rom, but it is occasionally done since the project is always moving.

4 The present situation

4.1 Structure of the project:

It is based on an international scientific committee of 22 members that join together every other year (http://www.unicaen.fr/rome/comite2000.html).

The direction of the project is insured collectively by Ph. Fleury and G. Jean-François, both are members of the Scientific Council of the University of Caen.

Basic competence is permanently insured by technical staff for:

- the document retrieval,
- the data base,
- the modelling,
- the cartography,
- web techniques,
- the audio-visual (photography, video, CD-ROM).

The researches are structured by module. A module can concern a mechanism, a building, a district or a topic. For a given module there is someone responsible who appeals to all the competence he can find to collect the necessary data.
From that time onwards, the technical realization will take place with, in every stage, a scientific validation.

The whole project leans on the resources and the technical competence of the Centre of Computer Resources, for all that concerns networks and operating systems.

4.2 Working:

Two persons in charge of the projects ensures a permanent link between all the persons who work on it. Moreover, the engeneers are all based in Caen. The decisions are weekly argued during our meeting, and the biennial session of the Scientific Comittee approve, or not, these choices. The constant arrival of new pieces of information, the results and all the competence insures a wide continuance.

Moreover, the electronic mail service is a perfect link to keep every participant involved, in such a project.

4.3 Results:

At the beginning of the third millennium, it is good to strike the balance of the project of virtual reconstruction of Rome.

The numeric data base occupies 7,5 Go and consists of:

- 3742 images, the size of which varies from a few dozens bytes to a few dozens megabytes with a resolution from 72 to 1400 dpi,
- 220 texts, the size of which varies from a few hundreds bytes to a few dozens megabytes,
- 517 architectural models,
- 50 video sequences of a duration of a few dozens seconds and occupying 480 megabytes,
- 24 monuments,
- 12 mechanisms.

The web serveur:

- It contains 1011 images for a volume of 120 megabytes. It was frequented for year 2000 by 2 170 247 visitors who consulted 2081 pages.
- Since its implementation in January 1996, its rate of consultation increased of almost 100 % a year.

The realized CD-ROM:

- It contains 200 images, 30 reconstructions, 40 pages of bibliography.
- It will be available on the 2\textsuperscript{nd} quarter 2001, at www.unicaen.fr/mrsh/puc/

This project was the object of numerous articles as well in the professional press as in the general public press. It was the object of numerous statements as well in France as abroad, and it was awarded the following rewards:
– Price Aeneas Year 2000,
– 1st price of the Festival Archeo-Virtua 1999 in the internet site category,
– 1st price of the Concours Lanfranc 1998 on the subject : "The Virtual Reconstruction of Hadrien’s Temple”.

4.4 Technical means:

Equipment:

For the 3 dimensions modelling:
The interdisciplinary consortium "TOWN-Architecture, Urbanism and Virtual Picture” has 6 workstations working under operating systems Windows NT or Windows 2000 Professional at its disposal.

These machines contain 128 to 512 Mb of RAM and are mono or bi-processors.

The total working space is about 65 Go to which it is necessary to add a space of protected storage (about 36 Go) and a set of files shared and protected (about 18 Go). In this set of shared files, users can find the works considered as finished at a given time as well as cartographic and photographic references to start a new modelling.

For the broadcasting of the information through Internet:

A Web site is settled on a Unix Compaq server accessible 24h/24h.

Software:

For the modelling and the realization of films, different software are used:

– Photoshop of the Adobe Company, for the digitalization of documents and the retouch of pictures,
– 3DStudio Max + Character Studio of the Discreet Company, for the modelling, and the mapping of the reconstituted buildings, the realization of video sequences,
– Premiere of the Adobe Company, for the mounting of video films,
– other technologies are on approval such as QTVR or VRML.

For the web server:

– this one is based on the Apache Server software of the Apache Software Foundation.

Networks:

The 6 NT workstations situated inside the University of Caen are connected to an optical fibre network at a 10 Mbit/s speed; they are isolated from the other machines thanks to a filtering bridge.

The UNIX server is connected at a 100 Mbits/s speed.

The LAN is connected at a 100 Mbits/s speed to the MAN which is connected to the National Research Network (RENATER) at a 155 Mbits/s speed.
4.5 Projects:

The ambition is to reconstitute the maximum of monuments and districts but before arriving at the finalisation, we try to give the result of the researches to many people, that's why our next objectives are:

– the generalization of interactive video sequences,
– the implementation of a video server,
– the broadcasting via Mbone of these sequences,
– the live broadcast of conferences made around the real model.

At present, tests are in progress to implement on IP networks the Quality of Service (QoS) required for this kind of project.

5 CONCLUSION

The new virtual visit of Rome is a success.

Digitization plays an essential part in it thanks to the networks which are becoming more and more efficient. Today, anyone can visit Rome at home.

Thanks to digital means, the visitor can follow the chronology of the city, and its evolution throughout time.

Moreover, Internet is essential for an international collaboration which is indispensable for our project.

In fact, we would have needed more money to go faster, but we have definitely preferred to work on scientific quality rather than speed of realization.

We chiefly look for new cooperations.
Libraries and Multimedia in the Digital Age

Alan Hogg
The Arts Institute at Bournemouth, United Kingdom

1 Introduction:

The Arts Institute at Bournemouth is a small (2,000 students) specialist art and design Higher Education institution in Southern England. Our speciality is film making, together with graphic design, model making and costume design for the theatre and for films. We also undertake industrial training in the print and multimedia industry.

In the mid 1990s the Arts Institute identified the need to build a new Library combining the traditional features of a Library with a high number (for the size of the college) of computers and to make it an interactive learning centre. This was just before the days of e-learning. The new Library opened in 1998, but we have learned almost as much since then as before the opening. The Library has been noteworthy for the way in which it has drawn together staff from different disciplines within the Arts Institute to work together, especially within the fields of library and IT. The conjunction has been of the nature of collaboration rather than merger.

2 Planning

In planning the Library I visited many other libraries in Britain and the USA. In England I visited a number of new college libraries to see how they were operating. I needed to know what mistakes they had made and what was successful about them. I was given a grant by the local Rotary Club to examine how libraries were using computers in the state of Pennsylvania, USA.

In Pennsylvania I visited two sorts of libraries; Small universities and specialist colleges like our own e.g. Pennsylvania University of the Arts, and Public Libraries using computers for e-learning.

I learned a lot from how public libraries were being used to retrain the unemployed with e-skills.

The public libraries of Pittsburgh, a steel making city which was re-creating itself formed a model:

– Used for classes of poor mainly black individuals being taught new skills
– Electronic Information Network of Allegheny County ; web site www.clphg.org/ein

This was the model used for our new digital library, using a team of planners from the college, derived from many of the academic schools.
3 Finance
Money is crucially important. When we began to think about building a new library, the thinking of Mrs Thatcher was still in fashion. We would get very little money from the government to build the library. The existing library was very overcrowded and the local fire brigade threatened to close it because it had so many people studying on the stairs. It was a fire hazard. We adopted a new approach to money, since no one would give us any. We had at that time an old building 5 kilometres away where some of the students were taught. This was expensive to maintain. If we closed this site, this campus and moved everyone to be taught on one site, with the money we would save we could obtain a loan, just as you would to buy a house. So senior management agreed that would be how we would get the money to build the library, just as anyone would in buying a house!

4 User Profile
The team spent much time thinking about the user of the library; an artist or designer. The user would demand access to many resources; books, journals, computers; Office applications, Internet and e-mail, Internal College Intranet, E-Journals, Digital Television with many channels, each other so that conversation should be possible, Design objects and lastly instruction on how to use software.

5 What the user wants:
The planning team thought that in the future students would want access to computers on a very large scale. We believed that each study place in the library should be connected to a computer. Also we wanted computer-training rooms to be available alongside the library. It was important for the library to be at the heart of the college and so the location was important and the new building was placed at the very centre of the site, the very centre of the campus. At that time a college Intranet did not exist, but the ability to use the Intranet was much in our thinking.

6 The architects
It was very important to have architects that shared our vision. We held an architectural competition. Ten architectural practices took part in the competition, including some international ones like Norman Foster and Richard Rogers. We had a problem of only having a limited price we could pay. We wanted architects familiar with how artists and designers work. We wanted architects who would be flexible and listen to our ideas. We chose a partnership called Renton, Howard, Wood, Levine (RHWL) who we thought would listen to our ideas; they have built arts buildings before.

The chosen shape would:
- Look Good
- Be a low price
- Be flexible
- Be good to work in

The resulting Library looks like many Audi and Mercedes car showrooms- which give an air of quality yet are not too expensive. With the architects we toured many libraries looking at the sort of building we thought would best serve our students. We were very pleased with the result.

7 Change of Government: 1st of May 1997

A big influence on our planning was the new labour government, elected whilst I was looking at libraries in the USA. They were elected on a manifesto of wanting to bring education to many poor people especially through lifelong learning and electronic learning. Libraries were seen as a vital part of their new agenda. The idea grew that libraries should offer training within them- an idea, which at the same time I was seeing in action in the USA.

8 Co-operation and Planning

The Library opened one year after the change in government, in March 1998. It had many computer terminals; mainly I-Mac based which artists and designers like. What the academic staff and students told us was that they wanted access to JANET. JANET the joint academic network, is the UK broadband internet system which gives fast (1.5Gigabytes per second), free access from universities and colleges to the wider internet. All the terminals are connected to both Janet and the College Intranet. The planning team very much built the Library in co-operation with the academic staff and their needs.

Also consulted were the disabled users in the college. The building has full wheelchair access with a lift to the first floor. In line with the government’s lifelong learning agenda the new library building contained within it 4 training suites of various sizes mainly to teach short computer courses, retraining those without computer skills, often to trade union members and the unemployed, often at weekends and in the evenings. This work was quickly noticed and we won various awards from the government for our involvement in lifelong learning. The library was successful because it came at the right time on an agenda given by the government.

It was successful in its initial role as not only a conventional library, but also as a place for e-training to take place.

9 The Digital Learning Environment; the Development of the Intranet

Also in the planning we saw the need for a Digital Learning Environment. The library would be a place where eventually students would be able to access on-line lectures. The building was wired from the start for e learning, with computer connections in the floor and walls. Unfortunately there were faults with the original wiring, which caused some initial problems, and much of the wiring had to be replaced. Although, initially, we were
involved in many training courses, these were not digital in any way, we didn’t do distance learning or learning over the college Intranet.

To implement e learning was going to be difficult. To plan e learning we started an

9.1 Intranet Working Party
The Intranet working party comprised:
– Many staff from the Graphic Design Courses
– IT manager
– Lifelong Learning Director
– Librarian
– College Registrar
– Representative from the Personnel Department.

9.2 The Intranet working party would:
Map overall activity within the Institute with a view to examining which areas could be incorporated into an Intranet at an early date.

Produce a model e-learning component for the Graphics Design degree. This area, together with the areas of course handbooks was agreed as being one ripe for activity.

Identify other areas for possible incorporation:
– Library Opac
– Registry functions.
– Institute Policies and Handbooks.

10 Library becomes Lifelong Learning
As a result of an increased role in teaching the Library was incorporated into a wider academic School, that of Lifelong Learning with e-learning and service to the wider community as key features.

11 Research Role
The new building was used for a European ADAPT project called DIME (Defining Multimedia Employment) with a researcher appointed to examine the nature of employment within the Multimedia Industry in the UK. This project lasted from 1998 to the year 2000.

We are currently working on more research projects:
– How the library may be used more effectively within e-learning
– How the library can contribute towards the UK Governments Key skills project.
– How the small design museum in the new library can be digitised.
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Selecting An Automated Library System for Finnish Research Libraries, Linnea2

Annu Jauhiainen
Helsinki University Library Finland

1 The Present Situation

All Finnish academic libraries and a number of other Finnish research libraries have used the VTLS software during the 90’s. The contract with VTLS Inc. was signed in 1988 and implementation took place during the following years. A unified network called Linnea was created, consisting of the local installations and a common physical union catalogue which all were connected by the powerful academic data transmission network FUNET.

The VTLS-based network, now called Linnea1, was very advanced when built a decade ago, and it has served Finnish libraries well. VTLS Inc. has also been a trusty companion of Finnish academic libraries during these ten years.

Creation of the union catalogue Linda in early 90’s was an ambitious project. Not only was data from all academic libraries loaded into a single database; software development was also needed. For example, a duplicate control algorithm was designed in Finland and implemented by VTLS. VTLS developed many unique consortium features which enabled the libraries to use the Linda database efficiently for copy cataloguing purposes. Depending on the library, 50-90% of MARC records can be copied. ILL localisation is also very efficient, because Linda contains summary-level serials holdings from about 400 Finnish libraries.

The Automation Unit of Finnish Research Libraries, created in the Ministry of Education in 1974, was instrumental in the implementation, development and running of the Linnea network. In 1993 the Unit, with all its tasks and resources, was moved to the National Library, where the Division of Library Network Services is now managing the Linnea1 network, functioning as a common agency for the academic libraries. In this capacity the National Library is also responsible for the new steps toward Linnea2, as the next generation network is called.

2 Selection of a New Automation System

To summarize the need for a new generation software we can say that all library system vendors are building so-called third generation library systems with relational database and Client/Server technology, graphical user interface and web gateways, the ability to search multiple databases simultaneously, multimedia support and support for internationally accepted standards such as Z39.50, Unicode, Edifact and ISO ILL, to meet the growing needs of the users. It was also evident that the classic VTLS system was coming to the end of
its life-cycle and would not be developed further since VTLS Inc. is concentrating on their new system, which is called Virtua.

The Finnish academic libraries have since early 90s enjoyed the benefits of being a consortium. The ten years of VTLS use have taught the libraries and all parties involved that co-operation is power, even if it is not always easy or simple.

Because of the great success of Linnea1, there was no need to revise the basic service philosophy when moving to a new system. Libraries were satisfied with the system and the work flows and with co-operation with one another.

When the present VTLS system was purchased, the Ministry of Education funded the acquisition of both software and hardware. This time the universities had to find the money out of their own budgets. Nevertheless, both the universities and their libraries wanted to ensure the benefits of the present common approach. Libraries also were open to totally new technical and organizational solutions if they should prove more favourable both functionally and economically. Libraries clearly wanted to avoid transplanting old patterns into a totally new environment. Everything had, therefore, to be looked at from a new perspective.

Three major issues had to be tackled: the selection of the software, the future database or network architecture and the maintenance of the hardware.

2.1 Selection of the Software

The Linnea libraries started to look for a new-generation library system about four years ago. The National Library was asked by the directors of the Finnish academic libraries to survey the systems either on the market or being developed at the time. A questionnaire was compiled and sent to the vendors who had recently been shortlisted in corresponding procurements in Europe or in the U.S. The vendors were asked about their database management system, database structure, standards, various functions and features, the user interface, languages and formats, training, support, prices and future plans.

Procuring a new library system for a large network is a major project which is regulated by European Union statutes. When the value of the contract exceeds the threshold, which is 200,000 euros at the moment, the procurement has to be advertised across the European Union. Of the three alternative types, the restricted procedure seemed to be the most suitable for the Linnea2 project.

When VTLS was selected in the late 80’s, the selection process was handled by the Automation Unit of Finnish Research Libraries alone, without much involvement from the libraries themselves. This approach was quite natural at the time, because there was little experience of library automation in the libraries. More than ten years after, the situation was completely different. Libraries were well acquainted with at least one library system and, most importantly, they knew what their needs were and what they wanted of the new system. The resources of the libraries were welcomed by the National Library, which, as the service facility of the academic libraries, had the task of coordinating the process and pulling everything together.
The procedure started officially in April 1998 and the tenders were received in July. At this point, tenders were invited for software only, another procurement was planned for the hardware once the software had been chosen. During the fall the tenders were evaluated thoroughly. Attention was paid to the technical structure and the technical solution of the system, references from present and future users of the system, the services and the support offered by the vendor and the quality and the completion of the various functions and modules. Four systems were shortlisted based on these criteria. They were Horizon, Innopac, Taos and Voyager. These four systems had been found to fulfil our requirements best in the first phase of the selection process.

At the beginning of the second phase the four short-listed systems were all on the same line. In nine months we had to find out which of the four was functionally the most suitable and economically the most advantageous for the local databases as well as the union and national databases. The systems were first demonstrated to a large group of library representatives. The next step was to get our hands on the applications. The National Library, together with the four vendors, organized the testing of these systems. This was the part of the evaluation in which the contribution of the libraries was most significant. Over 70 people from the libraries and the computing centres of the universities participated in testing, which took about three months. A number of testing groups, each specializing in different functions, i.e. cataloguing, circulation, acquisition, OPAC, etc. listed the merits of the systems, without knowing how the other groups ranked them. Objectivity was the main guideline here. In addition to the ranking list, the groups also produced lists of open questions. Answers to these questions were sought in two ways, through site visits and negotiations with the vendors. A group of six people, representing both the National Library and other libraries as well as the university computing centres, visited libraries using these systems, both in Europe and in the U.S. The site visits were essential in finding out how the systems worked in real life.

During these nine months of evaluation the National Library negotiated with the four vendors (Dynix GmbH, Innovative Interfaces Inc, Data Research Associates Inc and Endeavor Information Systems Inc) in several ways and on several occasions. The vendors came to Helsinki a number of times and we went to their headquarters once to talk with the development staff, support staff and the company management. There was also constant discussion via email whenever any questions about the functionality of the systems needed to be answered.

An essential feature in selection processes was a fair and objective treatment of all parties involved. Since every step was documented, we would have been able to reconstruct the process, should it have proved necessary.

We have been told both by many foreign colleagues and by the vendors that the Finnish library system selection process has been the most thorough ever carried out. It is clear that when purchasing a system for all major research libraries of a country we are dealing with a much more serious issue than satisfying the needs of just a single library.

When the different parts of the selection process were drawn together, Voyager, by Endeavor Information Systems Inc. proved to fulfil the criteria best. Voyager was found to be a complete, integrated system that was finished in the essential, traditional functions
needed by the libraries, but which however is being further developed to meet the new needs and changing technologies. It fits both individual Linnea libraries and the Linnea network well. Local services can be streamlined and their scope extended. But centralised services will also benefit from Voyager via its consortium-driven functions. Increased efficiency is largely based on improved networking since Voyager supports both Z39.50 and ISO ILL.

The company, Endeavor Information Systems Inc. had also been thoroughly investigated by an economic expert and found to be sound and stable, with good prospects. An example of the difficulties in anticipating future changes is that Endeavor has since then been sold to Elsevier Science, raising a number of question marks.

The National Library proposed to the libraries that Voyager should be chosen, which was unanimously accepted. The National Library was asked to conclude the negotiations with the company, and was also empowered to sign the contract on behalf of all universities and other bodies participating in the purchase. This happened on February 4, 2000.

2.2 The Network Architecture

One of the important decisions in Linnea2 was whether to merge existing databases or to keep the current structure. Discussions with Endeavor experts made it clear that although it is technically possible to merge databases, actually doing this would be time-consuming and expensive. The technical merits of such an action would be limited, since Voyager databases can be merged into a virtual union catalogue by using the Z39.50 Information Retrieval protocol. Politically there was quite a lot of reluctance among libraries to merge databases, even though Voyager makes living with a shared database much easier than our present system. A decision was, therefore, made to retain the 24 databases in Linnea2.

The next question was how many servers an optimal solution for the Linnea2 network would require. In the present Linnea1 network there are 17 HP3000 servers for the 24 databases. The number of servers was never really discussed during the implementation of Linnea1 because of the limitations of the computer technology of the time.

How far can one go in centralisation? The answer depends on three factors, the available data transmission network, the capabilities of the software and the state of the computer technology.

The Finnish Academic and Research Network, FUNET, is already at present a key factor for the Linnea network. Without the infrastructure provided by FUNET it would not have been possible to use the Union Catalogue Linda as a cataloguing tool in a way we have done since the early 90’s.

A shared server is not possible if there can only be one database on the server. The Voyager software allows an unlimited number of databases on a single server. However, practical experience from other Voyager consortia made it clear that there should not be more than about 5-7 databases on a single server, since a large number of databases means that much time may be needed for Oracle and Voyager updates: it may take several days to update many large databases, and during the process all the databases must be shut down.
More importantly, if all databases are dependent on the same hardware and operating system process, severe problems would have an impact on every library simultaneously. Fortunately, new server technologies make it possible to have a single server and still avoid this problem: there are servers that can be internally split into several logical (and physical) parts.

Both Sun and IBM, which are the platforms Voyager supports, can deliver cluster-like computers, which can be separated into logical parts called domains (Sun) or nodes (IBM). Each part has its own operating system process and dedicated hardware from network card to processors. To the operators and users, the server looks like a cluster of computers.

So there were no technical constraints on choosing the network architecture freely. Linnea libraries were eager to find out whether centralisation would save money. In the 90’s the resources and budgets of the Finnish academic libraries have been cut; this is unfortunately a problem common to all kinds of libraries everywhere in the world.

At the request of the universities three scenarios were analysed:

– centralised model; all databases placed on a single machine
– semi-centralised model; 3-5 servers
– decentralised model; the current number of servers

Cost analysis was based on both purchase price and the total cost of ownership, calculated for five years.

After a thorough analysis of the various options, Sun E10000 was chosen as the server system. The decision to go for Sun was based on technical merit and price. Both Endeavor and Oracle use Sun machines as their development platforms; this fact was also taken into account.

The Linnea2 server will initially have 28 400 MHz CPUs. According to Endeavor, this is enough for 1400 active users, or more than 5000 concurrent users, about twice as much as now. Both Endeavor and we felt that an ample safety margin is needed in order to avoid performance problems.

Of course buying a lot of CPUs is not enough; there may be other bottlenecks. The E10000 will have 24 GB of memory and 800 gigabytes of mirrored fiber disk dedicated to Voyager databases.

The universities had set an upper limit for the total purchase price of the software and hardware, including conversion of the databases. Because of the unfavourable exchange rate of the US dollar, the National Library felt increasing pressure to arrive at a low-price solution. We found out that even if list prices may tell you a different story, for a big customer like our consortium it was cheaper to purchase one big server system than a number of smaller ones. But bargain prices are not automatically offered. We managed to establish a competition between Sun and IBM in real terms because both companies saw Linnea2 as an important project.

After the server was chosen, the decision was made to outsource the maintenance of the new server to the Center for Scientific Computing, CSC, a non-profit company owned
by the Ministry of Education. It hosts Finnish supercomputers and maintains the FUNET network.

In spite of better maintenance coverage and better support from the hardware vendor, maintenance costs will diminish a lot compared with Linnea1. Basic maintenance of the 17 HP3000 servers takes about three man-years, but we estimate that a single E10000 will require less than a man-year. If this estimate is correct, we will save about two man-years or even more because managing a UNIX system is generally believed to be more time-consuming than managing an HP3000 computer.

Thus we have good evidence for the claim that an unprejudiced approach to server architecture has enabled us to combine significant savings with important technical improvements. Being a consortium helps a lot: libraries buying systems only for themselves will not be able to utilise new technology with similar efficiency. It is easy to understand from this point of view why library consortia are becoming more common in the US and some European countries. Finland has been one of the pioneering countries in this area, and our experiences from such co-operation are very encouraging.

2.3 Implementation

At present we are in the middle of the implementation phase. Building Linnea1 and implementing VTLS took several years, but this time all 24 databases will migrate from VTLS to Voyager during a fairly short period of time, April-August 2001. This means that everything has to be scheduled very carefully and the schedules have to be kept. We have a joint national implementation project, and each library has its own project. There are three parties in all of these projects: the Linnea libraries, the core group in the National Library and Endeavor Information Systems Inc. and all of these parties have to work together seamlessly.

Endeavor is doing some software development for us. In general we are buying the system off the self and didn’t want as many customizations as in the VTLS time, for we have seen the problems raising from localization, but there are some things that could not be avoided.

Training is a vital part of implementation. We use the “train the trainer” method, so that Endeavor is training only the trainers. This way we get customized training for Finnish local needs, and also save quite a lot of money.

Endeavor has converted several VTLS databases before, but in spite of that, testing the loads is important. Early tests for some sites were carried through in the fall and at present we are doing test loads for all databases, to make sure that the production conversions will be successful.

3 Conclusion

The cornerstone of this process has been co-operation, the will to pull together. This is not enough nevertheless: there also has to be a workhorse, to pull everything together. This is important, especially when there is no higher authority to manage the process, as was the case when Linnea1 was built and the Ministry of Education took care of the
negotiations and funded the whole process. This time university libraries felt the need to start the process of acquiring a new system together. They were willing to make an effort to find a new solution to improve the quality of their services, as well as to use their scarce resources for the evaluation, which was seen as benefiting all. They were also willing to find the money to pay for the new system, with everything included.

The Linnea2 consortium was build from below, the National Library acting as the workhorse but not as a higher authority. This was a successful approach. In order to continue this success, there must be a formal organisation for the consortium. That is why the Linnea2 consortium has just been established, with a formal organisational structure and bylaws.

The thorough selection process for a new automation system for the Finnish research libraries has not simply been a question of technology and technical expertise, which the National Library has been responsible for. It was even more a question of policy and cooperation. Many things may be possible technically, but politically they are not, unless you know how to handle them correctly and diplomatically.

Sometimes our neighbours in the Scandinavian countries say that libraries in Finland find it easier to co-operate than libraries in other countries. Of course, this is not true. Libraries in Finland are as individualistic as libraries everywhere. They also have their particular local needs. But there is obviously a will to co-operate, as difficult as it may be at times.
Moving forward in e-business
Distribution of scientific content via intermediaries

Meinhard Kettler
Swets Blackwell GmbH

Preface
The focus of this paper is on intermediaries for scientific information defined by the global journal subscription agents, the largest ones being Swets Blackwell, Rowecom and Ebsco. It is clear that traditional relationships in the information chain are changing with the advancement of electronic information delivery. Libraries, publishers and subscription agents are being presented with challenges to their familiar roles and positions in scholarly communication. New pricing and ways of ‘selling’ information (e.g. to consortia, individual articles, linking of various content types) present new procedures and systems, which also highlight the strong need for agents as intermediaries in the electronic environment.

1 The Librarian’s and end user’s view
Traditionally in the print business, it was the function of the librarian to facilitate accessibility to information and guide their users through a portfolio of titles and articles. The electronic world has introduced a series of new processes and concerns involved in reaching content. The rapid growth in consortia has led to a new role for the library as a part of a cooperative, increasingly demanding end users and in many cases a shrinking acquisition budget in real terms. Administrative complexity remains high (or even higher!) in the electronic world with licensing and pricing issues far from standard. As a result subscription agents have to become ‘infomediaries’ in the electronic environment, undertaking a type of consultancy role for libraries.

Librarians need to be increasingly aware of many individual publishers’ licence policies, pricing models, terms and conditions, for accessing electronic content from a particular publisher. This can be difficult in times of rapid transition with little standardisation amongst publishers. Librarians therefore seek guidance and clarity also from their subscription agents who have long established trading relationships with many thousands of publishers worldwide and the wealth of knowledge and expertise this has given agents. End users expect to be able to use the information as they wish to serve their research needs, and therefore, the responsibility of the librarian to educate them about what is and is not permitted is increasingly important. Librarians now need to know the law in order to understand licence agreements and the implications.

End users want ease and speed of access to information, with seamless linking from their preferred abstracting and indexing databases to full text. Librarians and information professionals want the choice to be able to purchase subject orientated packages of electronic journals or individual titles according to their collection needs, rather than whole collections from one publisher. They also want to negotiate, particularly as part of a consortium,
to achieve the best price and licence conditions. Customers want clarity, training, advice and guidance to find their way through a confusing complexity of pricing models for electronic journals, licence terminology, and delivery systems with different administration requirements.

2 The Publisher’s view

Publishers may not wish to admit it, but their role in the information chain is also called into question. The emergence of new publishing ‘competitors’ such as pre-print servers like PubMed Central, initiatives like SPARC; and the increase in cooperative purchasing by library consortia (not to mention the huge investment in electronic publishing technology) is threatening their core business. They must therefore develop forms of added value and innovative pricing models to at least maintain existing revenue streams.

Publishers need partners to provide them with information about current interests, reactions and movements in the market place - information which is increasingly valuable in an electronic environment characterised by experimentation, uncertainty and huge commercial investment. As a result, agents have naturally taken on a consultancy type role for publishers in being able to provide an overview of publishing trends in the electronic market place, particularly in the area of consortia purchasing and new e-journal pricing models. At the heart of the intermediary’s role is the harmonisation of both supplier and customer interests, which in the electronic world has presented many new and exciting opportunities for agents to add value. Subscription agents like Swets Blackwell may form partnerships with companies specialising in helping publishers offer their journals via the web. This includes all the work involved in converting journals into a format suitable for delivery over the internet, making the data accessible on a number of servers around the world and providing a range of related services that benefit publishers. By these means many smaller publishers now have an affordable option that enables them to offer electronic versions of their titles, with the research community benefiting from the increased accessibility of information they need. The more content suppliers can provide access to electronically, the more valuable their services will be to our library customers.

Subscription agents have been faced with the argument from some publishers and information providers that their future is under threat as an unnecessary intermediary in an electronic information chain no longer requiring postage and packing, a form of ‘disintermediation’. Although a highly simplified view, that has not proved to be right, it is nonetheless indicative of the agents’ need to continue to be creative in developing new services to meet the new and changing demands of both customers and publishers.

3 New Business models - new services from intermediaries

The impact of electronic journals on agents as intermediaries in the supply chain is clearly emerging as electronic publishing challenges the traditional selling of information. The focus is no longer just on a single journal as an annual subscription but on content segments e.g. a journal combined with other data such as tables of contents; a publisher’s entire collection; ‘bundles’ of subject specific journals; and single articles sold on a pay per view
basis. There is the trend for print journals to be cancelled in favour of electronic-only where offered by a publisher, and/or cancellation of multiple copies. All these changes bring new ways of pricing information as one size no longer fits all and price flexibility offered by publishers, particularly for multi-site corporates and library consortia, is demanded by customers. Inevitably this brings with it the requirement for systems and processes to handle special pricing and access conditions presented by publishers for specific customers or consortia.

Despite all these concerns, the subscription model is still dominant and will continue to be for a long time - regardless, if it is the model print journal with ‘electronic surcharge’ or the electronic journal as main product with optional print as ‘add on’. In the electronic world, agents as intermediaries will continue to add value in their traditional core areas namely content consolidation, accessibility (easy of access); and administrative consolidation (ease of doing business). It is unlikely, even in scholarly publishing that not one information provider is going to be the sole content provider or gateway to all required content wherever it may reside. However, compatible infrastructures and customisation of services to meet specific customer requirements is where the intermediaries of the future will play an important role in ways which extend the well established functions of agents in the print environment.

3.1 E-business and Subscription agents

Investment in systems and practices for electronic processing of orders, payments and other customer services and web-based value added services for customers and publishers, is essential for agents in maintaining their position as a valuable intermediary and aggregator in the electronic environment. Electronic processing of the agents’ traditional subscription services is increasingly demanded by corporate customers who are looking for ways of streamlining their processes for the benefit of lower costs without compromising quality. That is why the next logical step for subscription agents is the rapid development of own e-commerce systems and procedures, the essence of which is speed of operation. This strategy is crucial and a natural extension of the agent’s traditional role to support both customers and publishers by providing increased ‘speed to market’ of their products, for example through Electronic Data Interchange practices. The big subscription agents are used to exchange business data electronically with their partners already for a long time: subscription checklists, packing slips, invoices, claims for missing issues, price quotations, statistical reports with customers, renewals, invoices with publishers. The further development includes comprehensive online catalogues with integrated ordering functionality (web shops) as well as fully web compliant customer service and support. Another interesting direction is the programming of interfaces to link to e-procurement systems used by customers. These systems enable thousands of end users to place orders directly with preferred suppliers under pre-defined conditions.

For agents, e-business is a major opportunity to increase internal efficiency and quality at lower processing costs and to fully exploit their role in the new internet generation from the traditional ‘backbone’ of their service - streamlining the process of providing access to scholarly information. This is why the large agents are not afraid the Internet will harm
their position, they have proven successful at enabling the very many suppliers (e.g. Swets Blackwell trades with 65,000 publishers) and the very many customers (Swets Blackwell supplies to 55,000 customers with 400,000 shipping addresses) to do business efficiently. The use of Internet technology is simply a way of modernising our business practices (without of course forgetting the large investment and internal changes this demands) but with the promise of exciting opportunities to provide new and innovative services to customers and publishers as a result.

3.2 Content access platforms and E-journal services

Web technology and internet distribution offers increased opportunities for subscription agents not only to add value in the electronic business environment, but also to store, maintain and present the product, scientific content, via an own web platform. Competition, however, is increasingly diverse and intense. Publishers, libraries, and third parties have developed electronic journal services which compete with those of the subscription agents, and are highly cooperative at the same time. Major publishers have invested heavily in their own branded services, providing access to their e-journals e.g. Blackwell Science’s Synergy, Kluwer Online, Springer’s link, Wiley Interscience, Elsevier’s Science Direct. Agents deliver the subscriber to them by way of a gateway link via aggregated services offering a single interface, e.g. Ebsco Online, SwetsnetNavigator, Information Quest. With the development of CrossRef, a growing number of publishers are cooperating with each other to offer seamless access to one another’s journal articles. Meanwhile CrossRef publishers open their article link database also to affiliate members like subscription agents. Meanwhile CrossRef publishers open their article link database also to affiliate members like subscription agents. Using the DOI technology (Digital Object Identifier) this enables agents to implement thousands of links to fulltext articles in their access portals without having to negotiate with every CrossRef publisher individually. Another linking technology which came up recently and which simplifies linking articles between different web services is SFX, developed at the university of Ghent and owned by the company ExLibris.

Customers, such as library cooperatives, are also both competing and cooperating by building their own electronic information access systems and interfaces.

3.3 Licensing of electronic information

Agents have taken a proactive approach towards the increasing trend for licence issues to dominate the electronic journal acquisition process. The major subscription agents contributed towards the sponsorship of a series of standard licences, compiled by the publishing consultant John Cox. As a result, a number of publishers have agreed to use these model licences as a basis to form agreements with libraries. This proactive approach clearly demonstrates the agents’ interest to help and be creative in adapting to the changing environment, as licence problems are clearly related to electronic and not to print journals. It is also interesting to point out that the main purpose of this initiative is to simplify the licensing process and as result, to encourage the acquisition and access of electronic scholarly information. The value of a subscription agent has always been to streamline and aggregate information to make life easier for the information professional and as a result secure income for the publisher. It is natural therefore that agents are at the
Meinhard Kettler

forefront of initiatives to aid this process in response to the issues raised and procedures demanded by the advent of electronic publishing. Copies of the licences can be found at: www.licensingmodels.com

3.4 Consortia

The rapid increase in consortia purchasing has presented huge challenges to all players in the chain. From the agent’s perspective, the last couple of years have been a time of experimentation and market research, keeping an open mind towards this new purchasing phenomenon and where it is heading. At Swets Blackwell we have developed Consortia Services for libraries, based on a modular approach, designed to offer flexibility and choice in the recognition that each consortium differs in structure and requirements. The Swets Blackwell Consortia Services are wide ranging and include information on different publisher pricing models and electronic journal availability; publisher contact and mediation for price quotations; financial management (invoicing and payment); licence administration; ongoing maintenance, updates and renewals.

In 1998, Swets Subscription Service (now Swets Blackwell) was appointed the Managing Agent for the UK National Electronic Site Licence Initiative (NESLI). NESLI’s aims and objectives are to extend the availability of electronic journals to as many users as possible; to be attractive to publishers and libraries (and encourage participation) by simplifying the procedures involved in the purchase, access and management of electronic journals; to address the issue of serial price increases - as the trend continues for library acquisition budgets to decrease in real terms each year.

In its relatively short life, NESLI has provided a unique range of experiences for Swets Blackwell, and all parties involved, in areas such as publisher negotiations, e-journal pricing models, licensing issues and the arrangements for accessing journals. For 2000, agreements have been reached with 12 publishers, providing access to 2600 e-journals. A model licence (the NESLI Model Licence) is being used for the agreements between publishers and the participating higher education institutions. It is important to emphasise that as a result of the NESLI experience the appointment of a ‘Managing’ or ‘Handling’ Agent for consortia is in demand, a role the traditional subscription agent is well positioned to fulfil now and in the future. In the future, it is likely the position of ‘Managing Agent’ will be awarded following a tendering process, allowing agents the opportunity to present proposals, similar to the print business environment today.

4 The Future

In terms of predictions for the future, it is very likely that we will continue to see experimentation of systems, interfaces and procedures by libraries along with pricing models and policies by publishers for some time to come. There will be an increasing trend towards customisation of information on the part of the intermediary and the means of delivering this. Prices for electronic journals will increasingly move away from a historical print spend relationship, to other factors such as relative usage and size of the organisation. Increasingly we will see the choice to purchase individual electronic-only journals, together
with the option to buy subject specific packages and whole collections as is common to-
day. Article pay-per-view will be offered by an increasing number of publishers, but quite
possibly continuing to be viewed as marginal income. It is likely that there will be further
adoption of model licences by both libraries and publishers.

Alternative electronic publishing will continue to grow as the speed and reach of the
internet allows and library cooperatives grow in size and awareness. A publisher’s added
value which is now usually offered free as part of the ‘deal’, will become assets with
a price attached as they increase in value to the end user i.e. backfiles, linking, usage
data. Undoubtedly, consortia, multi-site and global licensing of electronic information will
continue to grow. The result will be even greater need for intermediaries to play a leading
role in co-ordinating and mediating between the consortium and a growing number of
publishers who want to participate in consortial agreements

5 Conclusion

Through the midst of this period of rapid transition, it is clear that the most successful
agents of the future will survive by continuing to follow the same fundamental and ‘tradi-
tional’ business practices as applied in the print world but with an acceptance that change is
quicker and necessary. The change from ‘print information’ to ‘print and electronic infor-
mation’ and subsequently to ‘electronic-only information’ will not fundamentally reduce
the potential of adding value for intermediaries like Swets Blackwell, Ebsco and Rowe-
com. However, realising this potential has required some fundamental changes in product
range, internal procedures and systems; innovation and development skills; and of course
speed.

For as long as the supply side of the chain remains fragmented (more than one publisher),
agents will continue to add value as ‘consultant’ (handling e-journal pricing and licensing
issues); as information aggregator, offering customised ‘turnkey’ services compatible with
library systems; and as ‘service provider’ serving help desk and trainer roles. As a result,
agents have, and will continue to, develop new services, systems and internal procedures
to meet these demands.
Multimedia Centre at the University - a Provider of Modern Information Technology Based Services for Teaching and Research

Peeter Kukk and Helle Lilleorg
Multimedia Centre, University of Tartu, Estonia

1 Introduction: Briefly about history of University of Tartu

University of Tartu was founded in 1632 by King Gustavus II Adolphus of Sweden as a classical university with four faculties and called Academia Dorpatensis. In 1802, after a hundred-year break, the University was reopened as Universitas Dorpatensis and in 1919 it was renamed Tartu Ülikool (University of Tartu).

Today the University’s 11 faculties and 4 colleges incorporate 70 departments, institutes and clinics, and employ 120 professors. The 14 000 student population is made up of fulltime and open university students, and includes about 400 exchange students from other countries.

2 Multimedia Centre at the University

2.1 Objectives and activities of the centre

The centre of computer graphics and audio-visual services in the University of Tartu was founded in 1995. Classical “teaching aid” service for faculty members of the university used to (1) design and print either single or multiple copies of overhead transparencies, slides, photos course materials, handouts, etc; and (2) design illustrations for textbooks and articles. The audio-visual service offered lending, maintenance, repair and installation of audio-visual equipment and assistance with its use both in the classrooms and at the conferences, workshops, organised in the University.

In the early period the centre’s task was geared to highlighting the University on various scientific conferences and technological fairs in Estonia and abroad. For this, large-format posters were designed and printed for presenting at scientific conferences and in advertisements of science. By 1997-1998 the centre had offset its development lag from the standards available.

Since its foundation, all work of the centre has been based on the use of modern information and communication technologies (ICT). Employees of the centre follow developments in these fields, and the scope of services they offer is widened in accordance with new ICT, provided the desired efficiency of teaching and research can be attained.

The main task of the Centre is to assist faculty members. The employees of the centre do not teach students on the regular basis. By early 2000, ISDN - network between university
and its colleges (in the Estonian cities of Narva, Türi and Pärnu), and other universities was established.

In 2000 the centre was renamed as Multimedia Centre and its objectives were expressed as follows: to assist in creating of virtual learning environment for both full-time and part-time students. The main tasks remained as they were before:

- To provide media services for teaching and research, using modern information and communication technologies
- To offer technical assistance for audio-, ISDN and video lectures, seminars, conferences, workshops, etc.

2.2 Customers

About 50 -60 % of the orders for services are received from the faculty of medicine. The other faculties that actively use the centre’s services include biology and geography, physics and chemistry, and exercise and sport sciences. The courses at these faculties can be taught more efficiently when different illustrative static or moving materials can be demonstrated to students in the classrooms. Less frequently are orders for media aid received from these faculties where much of teaching is based on classical lecturing.

The amount of the service ordered depends on the ICT skills of customers. Some people use only the technical possibilities provided by the centre, they themselves cope with all software problems. Some faculty members bring to the centre their handmade drafts of illustrations. In this case a computer file with its insertion into larger document will be ordered from graphic designers. Some customers come with their own computer files, which need additional retouch from graphic designers. All customers get consultations for solving their problems and performing their work more effectively.

2.3 Benefits for the University

Benefits of the Multimedia Centre for the University may be summarised in three points. It allows:

- To save time and money
- To give professional outlook for advertisements of science
- To concentrate on and to distribute high-level know-how

Time saving is achieved by distributing the duties between the faculty members and academic support staff who compile and prepare materials, and the designers of the Multimedia Centre who contribute their designing skills, computers with necessary soft- and hardware, printing and finishing facilities. This distribution gives essential time saving to the academic staff, as there is now need for them to learn the finest peculiarities of designing software and to know possibilities of different poster-, paper- and slideprinters. For academic staff it is essential that work be done professionally and in time.

Designing process of the students’ textbooks or illustrations for scientific presentations is a complex challenge for graphic designers as it requires accuracy and preciseness. There
are very many different types of software and technical instruments, which can be applied to produce drawings, graphs, etc. on paper or in files with different formats. Employees of the centre cope with the following tasks: choice of software best suitable for particular tasks, determining the complexity of design to make it acceptable for different printers, setting the optimal densities for scanning photos and choosing colour profiles needed for different printers in the Centre or in a publishing company. They also possess the valuable competence of design: layout of the illustration, poster, slide etc; balance between text and illustrations, types and sizes of fonts used, colour balance and so on. In all cases, results of using ICT as described above are determined by users’ ability of applying the available soft- and hardware in the most effective way.

Several of our customers have won prizes for the content and professional design of their conference posters. One of our customers has written in her feedback: "Mine was the only large-format poster on the conference. It was very attractive and I hope that my citation index will duplicate in the following years". In this meaning activities of the centre may be regarded as a PR project for science and education.

Saving of funds will be possible as the concentration of expensive printing and audio-visual equipment allows guaranteed provision of top-level services with a wide range of different equipment. In addition, the Centre expedites professional service and more intensive use of the equipment, as technical resources can be utilised before they become out-dated.

Professionals of audio-visual services also do consulting on media equipment and its installation for classrooms. This means that furnishing of all new and renovated classrooms of the university will be proceed from possibility to use in these rooms modern ICT. On the corresponding drawings they indicate lightening conditions of the rooms, position of the lecturer, the sizes of boards and screens in front of the room, distance of the first students’ sitting line from the boards and placement of overhead- slide- and data-projectors.

The Multimedia Centre in the University with its services is a high-level know-how concentration and distribution centre. Concentration of the know-how proceeds in two ways: employees of the centre should know and learn the latest developments; and the academic staff visiting different universities and scientific conferences all across the world tell us about the latest development in the media services. All information received is analysed and proposed to use in the university to larger or smaller extent.

Introducing modern ICT into teaching process in the university, employees of the centre have observed that a teacher/mentor is in the central position of the teaching process and ICT is her or his supporting tool. Great personalities may be educated only through human interaction, by motivating learning, appreciating originality and elegance of solutions to proposed problems, comparing solutions offered by different students. To accomplish these tasks, the committed instructor desperately needs any technical ICT device.

### 2.4 Price

"We recommend that the Funding Bodies, through the Joint Information Systems Committee, should continue to manage and fund, on a permanent basis, quality and cost-effective
Communications and Information Technology services for researchers and should, in due course, introduce charges for services on a volume-of-usage basis.\footnote{“Higher Education in the learning society” Summary Report of the National Committee of Inquiry into High Education, United Kingdom, 1997}

In the Multimedia Centre consultations are free of charge for university staff. Graphic design, artwork and technical assistance on AV as outreach services are charged on hourly basis. Printing and photographic services are charged on the quantity basis. The Centre provides all its outreach services at about 2 times marked up price.

\section{Now and Future}

The core task of the Centre will remain the same for the years ahead: assistance to academic staff in using modern information and communication technologies. It is due to the fact, that as soon as we have finished arrangements for one application of ICT, the rapidly developing ICT will have raised new opportunities, which should be introduced for the purposes of everyday teaching and research in the university.

At the moment there are several essential tasks, which have to be handled:

\begin{itemize}
\item Printing of course texts on demand: textbooks for students and slides of the same material, overhead transparencies or PowerPoint presentation kit for instructors
\item Introduction of CD production: we are ready to use MS PowerPoint and extensively learn Macromedia and related software
\item Training of faculty members on user skills of ISDN videoconference facilities for distant instruction from Tartu to the colleges of the university elsewhere in Estonia.
\end{itemize}
Personalised Library Portals and Organisational Change

Amos Lakos
University of Waterloo

1 Introduction

Top Library and Information Technology Association (LITA) experts, during a January 1999 American Library Association (ALA) Midwinter meeting, identified a number of important future trends for technologies in libraries. Trend 1: "Library users who use the Web, expect customisation, interactivity and customer support" deals directly with issues related to library portals. The group emphasised the user-focused approach as the trend of the future. They mentioned the University of Washington My Gateway and NCSU's MyLibrary@NCState (http://my.lib.ncsu.edu) as examples of customized library portals. Other library technology trends identified are also related to the possible impacts of library portal implementations - focused use of digital resources, interactive help, identifying "human" libraries for support, co-operative support among libraries and more.

By creating library portals, librarians can act upon two of the three Keystone Principles identified by a group of leading Association of Research Libraries (ARL) Library Directors. These sets of values are: (1) "Libraries are responsible for creating innovative information systems for the dissemination and preservation of information and knowledge regardless of format" and (2) "The academic library is the intellectual commons for the community where people and ideas interact in both the real and virtual environments to expand learning and facilitate the creation of new knowledge."

Customisable and personalised library portals address these values directly, by being customer focused, and empowering users to create personal information systems that are responsive to their individual needs. A library portal leverages the library’s expertise both in the form of the underlying database of resources built by librarians and through greater accessibility of those librarians.

Portals allow users to customise their web information, based on their personal preferences and needs. Academic libraries exist for the purpose of collecting, organising and disseminating information. They also help students become lifelong learners and enable faculty and students to maintain superior research activities. Libraries have to maximise their visibility and their usefulness especially to our primary customers - our own students and faculty. In short, branding is important for libraries. The development of personalised...

and customisable web portals or gateways is an important tool for enabling our customers’
better access to information they need. These portals will empower customers to create
their own information and research environments based on local and remote library re-
sources. They will enable close and effective communication between librarians and their
customers, and by implication create healthier local learning communities.

Personal portals have the potential of contributing to positive learning outcomes, as they
will be designed to be customisable to the needs of each individual. It also has the potential
of changing how libraries are used and how librarians will do their work. In short, these
portals have the potential of bringing about real change to our professional and organisa-
tional culture.

Academic libraries are presently confronting the issues of organisational viability and
relevance. Academic libraries are adapting to the new reality of the web - since 1995 when
Netscape enabled real access to the Internet, libraries stopped being the main owners of
the information gateway. The web has changed every aspect of life, but nothing changed
more than the size, rate of change and speed of information availability and delivery.

How does the issue of organisational relevance reflect on the future of library services and
with the promise of customisable and personal portals?

Interest in organising access to academic information and scholarly knowledge in a much
more systematic fashion, has been proposed in a thoughtful and future oriented paper by Jerry Campbell, Dean of University Libraries, University of Southern California. The paper proposes that the research library community investigate the feasibility of creating a
broad based "scholarly information” portal in order to continue the library community’s
basic function of providing information and learning and staying relevant in this new
exciting environment\(^3\).

2 What is a Portal?

There are various definitions, depending on perspective, mission or function. From a mis-
sion perspective, Gerry McCartney, Associate Dean and Chief Information Officer at the
Wharton School at the University of Pennsylvania, sees portals as whatever the institution
wants it to be. "A portal is a place that draws people to it because of what it offers and
what it enables.

Michael Looney and Peter Lyman define the web portal as "systems which gather a variety
of useful information resources into a single, ‘one stop’ web page, helping the user to avoid
being overwhelmed by ‘infoglut’ or feeling lost on the web”\(^4\).

\(^3\) Jerry D. Campbell, "The Case for Creating a Scholars Portal to the Web: A White Paper.”
ARL: A Bimonthly Report on Research Library Issues and Actions from ARL, CNI and

(July/August 2000): 30.
3 University Portals

Visionary university leaders realise that campus portals are transformational resources. These resources will change the way students, faculty, staff interact, learn, do research and work. Universities recognise that portals may be the way to engage stakeholder and client groups, empower them with access to branded campus information resources and communication tools and retain their loyalties as potential students or alumni. It is a community building tool.

A portal vision is emerging. Portal technology provides a central on-line tool to access and exchange internal information as well as links to external information, vendors and resources according to needs, mission and priorities of the institution. However, in order to integrate portal technology, institutions must focus equally on technology, strategic thinking, planning and systems thinking. They have to re-examine organisational missions, processes, and student, faculty and staff needs and re-evaluate educational philosophy with the task of integrating web technology into the pedagogy. For universities, the goal is to combine horizontal and vertical portal concepts into an integrated, personalised and customised dynamic interface for all users - in order to also foster a sense of community and belonging to the institution. This portal has to be simple, easy to use, convenient and comprehensive in its access to information, people and processes. Its development requires strategic thinking and co-operation between disparate units on the campus. Although the technical challenges are considerable, the real challenge is to foster an organisational culture change - and changing organisational cultures is very difficult indeed.

It is important to emphasize that portals in any form are collaborative tools. Higher education in the new information environment demands collaboration between campus stakeholders who are used to a high degree of independence. Institutional wide portal is only possible with effective inter-departmental commitment.

Portal implementation is challenging. Richard Katz, Executive Vice President of EDUCAUSE, noted "that the implementation of a portal strategy is necessary, difficult, and perilous in higher education. It is necessary because colleges and universities - to both realise the full benefits of their investments in data warehouses, enterprise systems, and other elements of the campus infrastructure - will need to integrate information, services, and infrastructure across a seamless and easy-to-navigate Web interface. A portal strategy is difficult and perilous because many on campus are weary and suspicious of yet another new enterprise-wide information technology initiative, and because portal initiatives, by definition, require across-the-institution agreements on approach and design that are hard to achieve in loosely coupled organisations like academic institutions."

Robert Kvavik, Executive Vice President at the University of Minnesota, noted on a number of occasions while speaking on the implementation of the My One Stop portal that it forces those involved to think outside the box. The project illustrates the need for planning.

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5 Michael Looney and Peter Lyman, 33.
and the need to involve stakeholders early and for visionary leadership. He points out that the campus portal receives about 13 million hits a month on average with about 3 million pages downloaded versus early numbers, which were around 13,500. Based on these numbers, one can conclude that the portal must is a success and real change is possible.


Developing university portals in collaboration by sharing open source code is well described and documented by the JA-SIG Portal Framework Projects, in the Boston College Whitepaper on the subject. Other examples of collaborative implementations are University of British Columbia’s MyUBC -jsphttp://portaldemo.ubc.ca/index.jspand University of Delaware’s UD and ME -http://www.misc3.udel.edu:9091/portal/.

4 Developing Academic Library Portals

The academic library portal development has to be understood strategically as part of the campus portal plan and its implementation integrated into the campus portal planning process. While this is a big challenge, the library can both advance it’s own mission as well as strengthen the universities mission of creating an integrated learning and research community by partnering with faculty and other stakeholders.

Within the context of a campus enterprise portal, an academic library has to consider some of the following questions as it plans it’s own portal strategy:

– How can a portal enable more clients to use the library’s resources and services more effectively and more conveniently?
– How can a library portal empower clients to be more self reliant in their information seeking activities?
– How can librarians provide more effective public service?
– How can the portal save time for clients?
– How can the portal promote information literacy?
– And more . . .

– Examples of academic library portals are -
– California Polytechnic State University, Robert E. Kennedy Library - http://www.lib.calpoly.edu/mylib/cgi-bin/index.cgi

The continuing viability of libraries is in finding new ways to carry out their core purposes of collecting, organising and disseminating information and teaching information literacy. The Web is the preferred tool used by most of our users to search for information, to communicate, to be entertained, to shop, etc. Most of our customers prefer to interact with us via the Web. In order to survive and stay relevant in this information environment, libraries have to create environments and services that respond to user needs directly, interactively and in timely fashion. Libraries and universities have to make access to information seamless, relevant and personally useful to clients and stakeholders - while at the same time competing with new information providers.

This places tremendous stress on our human resources and on our facilities. The way we work is being constantly pressured - to change. New resources and new technologies are added at very fast pace. Infrastructures and people are struggling to keep pace and people search for some kind of stability. Job content changes rapidly and skills have to be continuously upgraded. Although the purpose and service values of librarians will stay focused on customers, what librarians will be doing, how they will do their everyday tasks and achieve their goals will change dramatically. The portal may be one of the change agents.

The library, as an academic information service environment which maintains links to local and remote information resources, makes the NCStateMyLibrary@NCStatetype of portal available in order to provide students and faculty with a more effective web experience for their learning and teaching needs, thereby making the library and its services more effective, productive and responsive to client needs.

Librarians have been and continue to be concerned that the library is losing its importance, centrality and its perceived usefulness especially with the acceptance of the web as the place where students look for information. Many see disintermediation as dangerous to libraries and librarians. However, designing useful library web sites - based on ongoing usability studies - may be one way of keeping the library relevant and useful for our customers. Librarians will concentrate on developing learning modules in close co-operation with faculty and systems staff. They will increasingly concentrate on teaching research and writing skills. On the collections front, libraries will concentrate on leasing vs. ownership, creating seamless and intuitive access to information.

For libraries to succeed in their new tasks, libraries have to enhance, change and transform their organisational and professional cultures.
5 What is Organisational Culture and Why Does it Matter?

Organisational culture is important because initiatives and changes undertaken without its consideration often have unforeseen consequences - and usually negative ones from the perspective of organisational effectiveness. Culture matters because it is a "powerful, latent, and often unconscious set of forces that determine both individual and collective behaviour, determines strategy, goals and modes of operating". Leaders and managers patterns of thought and activities are often determined by culture.

Organisational culture focuses on beliefs, values and meanings used by members of an organisation, and the practices and behaviours that exemplify and reinforce them. Researchers, consultants and managers have gravitated to the concept of culture in order to better grasp why and how organisations originate, evolve and operate. Culture is not simple. It is tempting to think about culture as just "the way we do things here," "the rites and rituals of the company", "the company climate", "the reward system" or "our basic values". These are all manifestations of culture, but not at the level where culture really matters. A better way to think about it is to realise that it exists at several ‘levels’ and we need to understand the deeper ones.

Organisational Culture refers to the overt and covert rules, values and principles an organisation owns and that is influenced by history, custom and practices. These are enduring set of tenets and norms that form the basis of a social system and allow the members to attribute value and meaning to the external and internal events they experience.

The essence of culture is the jointly learned values, beliefs and assumptions that over time become shared and taken for granted. This results from a joint learning process.

Organisational culture is stable and is difficult to change. It represents the accumulated learning of a group. The important parts of culture are essentially invisible. Culture is the shared mental model that the members of an organisation hold and take for granted. Culture is difficult to decipher for insiders. There is no right or wrong culture - except in the relationship to what the organisation want to achieve. The relative strength of an organisation culture is dependent on how well the group deals with external adaptation and internal integration. In essence, the organisation needs to pay attention to its survival as an organisation and to its processes and structures - to the systems it uses to do what it has to do in order to deliver its products and services in such a way that it ensures its ability to survive in the long term.

6 Library Portals Impact on Customers

Library portals have to be simple to understand and use. Customers need automatic access to their personal portals, in order to insure acceptance and increase usage. Ease of access,  

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useful information together with ongoing promotion of the service will increase student use. The portal should be customised for clarity, simplicity of use, links should be self-evident and ready for information retrieval and should have very flexible personalization options. The portal should empower the client to get what they want when they want it and will decrease the anxiety of interacting with librarians or reference environments where they feel inadequate.

Access to subject content will be customized for local study and research needs and customers will be able to add personal options. They will have the ability to focus on their needs - in essence create an environment where they can get most of their learning and research information easily, with expert advice and in a timely fashion. A personal library-subject based portal will save time and anxiety. An outcome may be more self-confident students. The portal should increase students’ confidence in the information search process itself. The portal should enable librarians to assess and evaluate the quality of their services, as well the contribution of those services to learning outcomes. Only by instituting continuous customer focused assessment environments and processes, will we ensure that service quality remains positive.

The MyLibrary@NCState type of portal enables clients to easily identify and contact a librarian. They will have very current updates about new library services and happenings. Students and faculty will receive updates for local resources they need, such as lists of new books in the call-number ranges they are interested in, tables of contents for new resources, lists of newly acquired resources in their subject, etc. With seamless campus portal integration, students will have easy access their course schedules, academic advisors, course assignments and library resources directly related to the specific courses. Assignment specific library support could include special bibliographies, library resources and user education activities focused on the course.

Students and other stakeholders will have enhanced access to one-on-one consultation with librarians about specific needs. Focused, subject specific information will be pushed to the client automatically. User will expect service wherever they are, at the time they need it and in a variety of venues. In short - better service will raise client expectations - which will continue to challenge the library.

7 Library Portals Impact on the Library and on Library Staff

One of the crucial points about the NCStateMyLibrary@NCState application is that librarians who create and plan the content do not have to bother with HTML and other technical issues. The technical details are in the background and are not their concern. The focus is on the customer - provide external simplicity but hide the underlying complexity of the portal.

This is a very powerful idea. Librarians don’t have to become immersed in the details of the technology to be able to continue to do their job in the new electronic library. They join the patrons on the other side of the technology. The librarian is freed to concentrate on creating content, organising information for the customer and teaching. The need for partnering with faculty, for teaching and research will become self-evident - even to the
faculty. In this environment, the librarian will know more about the needs of the customers, since communications channels will be personal and persistent. The librarians can form a community with the patrons and the Web becomes the medium of communication. The Web becomes less like a radio and more like a telephone. Librarians will work in a more interactive mode, closer to their customers; the dialog we be on a more even footing.

Librarians, Information Technology staff and other university staff will have to co-operate more. The portal implementation itself will force collaboration, systems thinking, and will break-up functional silos. Staff at every level will realise that in order to succeed in this environment, collaboration, openness with information will become essential. All systems are interconnected and a diverse work force has to work together in order to enable customer centred services.

Good database design will increase the value and the life span of the data it contains. Bad database design can be a liability for a long time to come and a sinkhole for scarce resources. The primary requirement for good database design is close collaboration between the technical people building the database and that database’s end users, in the library’s case, the librarians and the patrons.

Personal interaction with the customer - through e-mail, instant messaging, consultation, real time contacts will increase. This means that librarians will have to reevaluate, re-prioritize and restructure their work. Libraries will have to rewrite librarians job descriptions. But mostly librarians will be able to concentrate on service outcomes for customers - because the customer will be closer and more directly demanding.

From a system of learning new skills, librarians will transition to a lifelong learning framework. This environment will need flexibility and capability to enhance new technical and non-technical skills. Librarians may need to develop new communication skills using new tools. Librarians will continue to develop new skills, with training becoming part of work. Training and constant learning will be emphasised and expected. New ways of delivering local, distance services are already being developed. 24/7 reference services are being built. Libraries will concentrate on developing flexible, multi-tiered approaches and innovative alternatives to current public services.

Librarians will have to focus to acquire and maintain personality traits of flexibility, friendliness and tolerance such as:

- Adapt to even faster changing technological environments.
- Maintain healthy scepticism of technology
- Maintain a high degree of curiosity
- Develop and maintain customer focus
- Develop and maintain good relations with faculty as well as students

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Work co-operatively with different types of people with diverse personalities and cultures.

Maintain the desire to work independently and co-operate constructively.

8 Library Portals Impact on Library Structure and Internal Communication

The library portal framework, together with the resources and the processes needed to make it work effectively and efficiently, requires open systems of internal communication and for an understanding of the relationship between systems and people. By clarifying the direct links between well designed and accurate data structures and information seeking outcomes, as well the direct relationship between the visible and the invisible aspects of library services, the library portal can become a force for change.

This means that libraries will have to be more open, flatter organisations, where all work is interdependent. Management will have to be thin, responsive and discourage functional silos. Ideally, groups and teams will be empowered and encouraged. New jobs will emerge and creativity will be appreciated.

9 Library Portals Impact on Continuous Assessment

If we build the portals well, they will change libraries, enable librarians to be more effective and create learning communities. Library Web portals will inevitably make libraries and their staffs more customer centred. All the work involved in creating and maintaining a dynamic library portal, from the attention to well designed OPACs, precise metadata and good indexing, to building dynamic subject based resources and making librarians more visible and accessible through the portal, will invariably result in better customer relations for the library. It will surely have a huge impact on learning outcomes for the students, enhance research and build better learning communities. To ensure that these outcomes become realities, we have to create organisational cultures that incorporate continuous assessment of our systems and outcomes.

We can only ensure that our new methods are effective by gathering feedback. Jakob Nielsen has led the way in devising effective ways to test and improve the usability of Web sites. We must realise that the database-backed Web site has its own tool of self-assessment built right into it. The database for a portal must contain a profile of each user’s preferences. It can also be used to track usage automatically. Systematic analysis of usage logs and attention to client feedback will keep the portal dynamic and relevant. In addition to these assessment tools, libraries have to continuously survey the level of customer satisfaction and create measurable high service standards. To succeed, libraries have to create a culture of assessment.


10 Conclusion

The portal will become the agent, which transforms the library into a learning organisation. Building a portal takes vision, leadership, and sustained co-operative effort from many diverse stakeholders, systems thinking, organisational openness and promotion of personal trust. The portal will force universities and academic libraries to focus on outcomes to customers. Portals will help institutions respond directly to customer expectations with visible increase in service quality and learning outcomes. A successful portal will also enhance the learning and research environments of the campus and will contribute to a better informed and more open society. Ultimately, the portal will change the organisational culture of institutions of higher learning and help them evolve into real learning organisations.
Information at the fingertips: a portal for biomedicine

Elisabetta Marinoni, Pierangela Mazzon, Monica Ortolan, Donata Pieri, Roberta Sato, and Antonella Zane

Università degli Studi di Padova (Italy)

1 A portal for biomedicine

The amount of information potentially available for the biomedical researcher has grown exponentially in recent years. Most of this information is available on-line, but efficient and exhaustive use of it is rendered problematic by the way in which it is organised. The researcher is often confused by the quantity of information and by the lack of quality control of that information.

The documentalist therefore has a strategic role to play in the orientation of the researcher’s choices.

In order to meet our users’ needs, we have begun a portal project for biomedicine that may be able to supply, in a systematic if not exhaustive manner, indications and suggestions to those searching for information on the Internet.

A portal is a service that functions as a mediator and as a collector of information for Internet users, enabling users to access a large quantity of resources, by means of a particular point of entrance to the Internet.

The portal we are creating is a tool being prepared for the researcher and not for the librarian, and is therefore a reference tool.

It will be organised, even if not explicitly, along the lines of the Library of Congress and the National Library of Medicine classification systems, since this is the way in which documentary material found in biomedical libraries is usually organised. Researchers will therefore find themselves in front of an open-shelved virtual library, where the resources relating to a certain topic are in proximity to those relating to similar topics. Information being looked for often cannot be expressed easily with a query, but requires a path consisting of successive approximations, until the best source of information is identified.

The purpose of the current work is to illustrate the project by means of the preliminary phases of examination and choice of the sources of information as well as by means of the first model for the organisation of those sources, which was done in order to facilitate research for those operating in the biomedical sector.

The factors that we have been obliged to consider dealt with:

1. Search and selection in the resource network;
2. Presentation of Web resources within our site.
We focused our attention on the quality of the information resources to be made available to our users and on the construction of an efficient virtual version of our library.

As far as the selection of resources is concerned, we considered the following characteristics:

**Authoritateness:**

authoritateness was determined both by taking the body responsible for the resource into consideration, and by considering the number of links that lead to the resource itself, assuming that a very "linked" resource is authoritative.

**Appropriateness:**

appropriateness was evaluated by examining the pertinence of the documents to the mission of a bio-medical library

**Stability:**

the most stable resources were evaluated and links to meta-resources, which, because of their very nature, are less subject to URL changes, were given priority.

**Friendliness:**

as far as friendliness is concerned, the following were considered: ergonomics (making it possible to navigate following free associative paths, without the risk of getting lost), and the independence of the browser type.

**Updating:**

the resources were also evaluated on the basis of regular and punctual updating.

In order to guarantee the quality of our Web pages, we referred to the guidelines that have by now become standard for Web page publishing, guidelines that could help us present the information in a homogeneous manner.

**Web design: guidelines**

- Create a site identity
- Give each page a title
- Simple and synthetic screens
- Centre important links on the screen
- Distinguish links from text and graphics
- Reduce to a minimum the necessity for scrolling
- Provide help for users
- Use graphics, animation and moving banners minimally.

Our objective is to choose resources and construct Web pages that are an effective help not only for researchers and senior students but also for undergraduate users, tailoring specific search paths for the various user categories.
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Spontaneity and Delay Considerations in Distributed TV Productions

Susanne Naegele-Jackson, Michael Graeve, and Peter Holleczek
Regional Computing Center Erlangen (RRZE) of the University of Erlangen-Nuremberg

1 Preface
During the online edition of video material for television over data networks a major concern is the accumulation of delay over the production chain. Before a video signal of a camera arrives at a remote studio to be edited live, it travels over video adapters and analog/digital converters to codecs which in turn compress the signal to comply with small bandwidth constraints. This technical process adds a significant amount of delay that makes it difficult for the camera crew and director to interact spontaneously. An additional amount of delay is added through their human reaction times as well. Meaningful interaction requires however, that the overall delay times stay within tight limits.

The study evaluates the chain of events during the distributed online production of television shows in the project "Uni-TV" and investigates where delay times can be reduced significantly during the process. The use of low-latency codecs and cameras that are remotely controlled over the network is proposed to reduce the interaction times between a camera crew on location and the director at the distant studio. Additional equipment such as analog/digital converters only add very insignificant amounts of delay to the process and are therefore considered fixed parameters.

2 Basic Concepts of the Project "Uni-TV"
The main focus of the project "Uni-TV" is to produce university lectures online for television. This distributed production requires high bandwidths to ensure studio quality and low delay times to allow for a speedy interaction between the camera crew on location and the director at the remote studio. During the production process delay is introduced mainly through the compression and decompression of the video signals to reduce the data volume for transmission. Additional delay is added through the human interactions during the editing process. Whereas so far the camera crew and studio personnel have been separated at distinct locations, it is now being investigated how delay times could be minimized by remotely controlling the cameras from the studio over the data network.

Both the University of Erlangen-Nuremberg (FAU) and the Technical University of Munich (TUM) provide lectures and technical staff for the television productions. The video signals are transferred from especially equipped auditoriums to the studio in Munich at the Institut fuer Rundfunktechnik (Institute of Broadcasting Technology) (IRT) where a director of the Bayerischer Rundfunk (Bavarian Broadcasting Channel) (br) is standing by to edit the arriving video signals online. A script for the production is developed by
the Hochschule fuer Fernsehen und Film (University for Television and Filming) (HFF). The material is broadcast on a regular basis on the educational channel br-Alpha of the br. The distributed production takes place via the Gigabit Testbed South/Berlin with its nodes at the Regional Computing Center Erlangen (RRZE) and the Leibniz Computing Center (LRZ) in Munich, and also via the campus networks of the universities and the citywide network Mnet of Munich.

3 Introduction of Delay During the Production Process

During the production process three cameras are used to film the presentation at the auditorium. Two of these cameras are remote controlled from within the classroom (Figure 1). The analog video signals travel from the camera to their remote control units and are then converted into valid digital signals with 270 Mbit/s each. Although the Gigabit Testbed South/Berlin offers three channels of 2.5 Gbit/s ATM bandwidth per channel the data volume is reduced by compressing the signal into MPEG-2 (4:2:2) format. Once the signal has been transmitted over the network, the process is reversed and the signal decoded into a digital video stream again. Afterwards the video signal is synchronized and displayed on studio equipment for the director to see. The director then produces an online edition using the three different camera signals and the electronic version of the presentation material.

Figure 1 - Remote Controlled Camera
Since the director also instructs the camera personnel on additional focusing, zooming or changes in camera positions, there is a constant interaction between camera crew and studio on an audio transmission line where the added delay must be kept to an absolute minimum if spontaneous reactions or surprising effects are to be captured and the live element of the event is to be preserved. Before the camera crews are able to follow the director’s instructions, however, the digital audio signal must travel from the microphone of the studio to the encoder and over the network to the decoder, before it can finally be converted back to an analog signal and pass through an audio mixer onto the headsets of the camera crew at the auditorium. After the initial reaction of the cameras it takes another cycle of conversion, encoding and decoding of the signal, until the new camera angle can be displayed and the director can actually tell that the instruction has been carried out. Due to the large amounts of delay involved the process requires a lot of discipline and patience on both sides.

4 Fixed and Variable Intervals of Delay

The delay of the production process can be described as follows (Figure 2):

At time \( t_0 \) the actual event takes place. During the time frame \( t_1 - t_0 \) the camera signal is transported to the remote control unit of the camera and sent to an analog-digital converter from there. The A/D converter translates the analog video signal into a valid SDI signal which in turn can now be compressed into MPEG-2 (4:2:2) format and packed into ATM.
cells from time $t_2-t_1$. The ATM cells are transmitted during the time frame $t_3-t_2$ and then decoded during the time period $t_4-t_3$. After decompression the video signal is available at the studio for further processing. An additional delay $t_5-t_4$ is introduced for the frame synchronization before the video signal is displayed on a digital monitor and digital video editing system. At timestamp $t_5$ the event is visible to the director.

By then the director in the studio takes time $t_6-t_5$ to react to the pictures and to give instructions to the editing personnel. The audio signal carrying the instructions passes through the studio equipment during time frame $t_7-t_6$. Afterwards these audio signals are compressed by the MPEG-2 codec during the time slot $(t_8-t_7)$ and then are retransmitted to the auditorium $(t_9-t_8)$. The signal is decoded during time frame $t_{10}-t_9$ and travels through the studio equipment at the auditorium before the director’s instruction is finally noticeable to the camera crew at time $t_{11}$. The camera personnel reacts to the director’s instructions during time period $t_{12}-t_{11}$. The changes made by the camera crew will then need another transmission cycle until the signal arrives at the studio for the director to see the result at time $t_{17}$.

During the whole chain of events the longest delay is caused by the encoding and decoding processes of the codecs. The delay times are dependent on the codecs being used and their compression settings. For the project "Uni-TV" the video signals are compressed into MPEG-2 (4:2:2) I-frame only with 625 lines per frame and 720 pixels per line. The ATM PVCs (Permanent Virtual Circuits) configured for the transmission of the camera signals over the ATM network are implemented as Cbr (Continuous Bit Rate) traffic streams with 50 Mbit/s bandwidth to include embedded audio.

Codecs that compress in MPEG-2 (4:2:2) format usually take between 200ms and 400ms for both encoding and decoding (one way) depending on the hardware. The transmission time for the ATM cells from Erlangen to Munich and back to Erlangen again across the Gigabit Testbed has been measured to range from 2.2870ms (in the case of a 0.67% workload on a STM-1 interface (1 Mbit/s)) to 2.2981ms (in the case of a 99.99% workload on a STM-1 interface (149.745Mbit/s)). The cell delay variations ranged from 5.4μs to 10.9μs.

The mere optical signal transmission time takes about 2ms over a round trip distance of approximately 400km and can be calculated as (Distance/Speed of optical signal over fiber) or $400\, \text{km} / 200*10^3 \, \text{km/s} = 2\, \text{ms}$.

The delay times $t_3-t_2$ and $t_9-t_8$ of the ATM transmissions are therefore considerably shorter than the total latency of 200ms to 400ms introduced by the encoding and decoding of the video signals into MPEG-2 format. The time periods of analog and digital conversions or frame synchronizations can also be neglected in comparison to the codec compression times. Alteration of these delays does not pay off and the intervals can therefore be considered fixed variables.

## 5 Minimizing Delays

During the end-to-end process there are two main areas where a lot of delay time is spent: The human reaction time and the time interval needed for encoding and decoding (Figure 3).
Figure 3 - Main Delay Categories

1. Initial encoding/decoding
2. Human reaction (director)
3. Encoding/decoding of instruction (for a new camera setting)
4. Human reaction (camera crew)
5. Encoding/decoding of new camera settings

Although a delay around one second may seem small (Figure 2), it can be very annoying during the interactions between the camera personnel and the director, since additional reaction time of the camera crew is introduced before the director is finally able to see his instructions take effect over the distance. The ITU-T recommendation G.114 indicates a limit of only 150 ms as appropriate for a one way transmission time (ITU-96) for bidirectional traffic.

The human reaction of the director and the camera crew cannot be accelerated with technical equipment. Using a stop watch and taking the amount of time it takes a person to stop the clock a reaction period of 100ms to 120ms can be measured. In this experiment the person pressing the button of the stop watch is prepared for the event and will press the button fairly quickly. In traffic situations, for instance, where events are not expected, reaction times are considerably longer and last from 300ms to 1000ms depending on the alertness of the person involved. In the studio environment the situation is similar, since the crew behind the cameras has to react quickly to a sudden request for change by the director. Even with a lot of experience and practice the time span can only be optimized to stay within a minimal limit due to the human factor.

One way to minimize delay is to place the camera personnel next to the director at the studio (Figure 4) and use remote controlled cameras.

This way the time it takes to convey the instructions of the director to the camera crew is almost minimized to zero (3a), since the camera personnel only needs to hear the spoken word in the studio and no encoding, decoding and transmission of the director’s new instructions are necessary. This reduces the regular encoding and decoding period by 200ms to 400ms depending on the hardware of the codecs. However, there is still some delay involved (3b) for transmitting control information from the control panel to the camera to
actually change the settings. Even by handling the cameras via remote control from the studio two encoding and decoding cycles remain \((1 + 5)\). To further speed up the process the time intervals consumed by the codecs must be shortened.

Encoding and decoding delay times are very much determined by the equipment that is used and as such have - next to the underlying quality of the network - a strong impact on the overall quality of a transmission. A pair of codecs can be fine-tuned for optimal picture quality, latency or limited use of bandwidth. All of these parameters cannot be optimized at the same time, however, since their realizations are conflicting goals. In order to be able to process the SDI video signals of 270 Mbit/s in studio quality the broadcasting environment insists on the compression format MPEG-2 (4:2:2) with 40 Mbit/s bandwidth and I-frame only encoding. Whereas the latter favors short latencies, since complicated prediction patterns such as IBBP are avoided, the bandwidth demands are high in order to preserve contrasts, color and luminance information.

Another way to avoid the delay caused by the encoding and decoding cycles of the codecs is to replace the devices with ATM adapters that capture the digital video signal and map it directly into ATM cells with a lossless algorithm. Such ATM adapters have just recently been developed at the IRT in connection with the Fraunhofer Institute and are capable of mapping a 270 Mbit/s video stream onto an ATM PVC with a delay of only 350 \(\mu s\).

Therefore, the coding and decoding intervals become negligible. Figure 5 shows the new chain of events using an ATM adapter (again with camera personnel acting on location and the director at the studio). With such small latencies the spontaneity of the human interaction should not be noticeably impaired.

6 Summary and Future Outlook

The end-to-end delay that accumulates during the production of video material over a network is mainly caused by human reaction times and by the encoding and decoding process of the codecs. While human reaction times can only be reduced to a certain level through experience and practice, the technical delays can be shortened by using cameras that are remote controlled over the data network and by providing low latency codecs.
The continued focus of the project "Uni-TV" will be to convert the current standardized production into an improved online editing process. Delays will be minimized with the use of ATM adapters and remote controlled equipment.

Bibliography

Preface

With mounting pressures on libraries caused by the ever-expanding range and number of information sources in print and electronic format, the attractions of library co-operation are clear. Areas for co-operation may be in sharing resources or technical expertise or in working together to obtain favourable licensing or purchasing conditions. Many library consortia are based at national or regional level. The Decomate II consortium is unusual in being subject-based across national borders, involving university libraries in six European countries.

1 Background: the Decomate and Decomate II projects

The Decomate II project, which ran from February 1998 to July 2000, was partially funded under the European Union’s Telematics for Libraries programme. It sought to develop a working model of a Digital library for Economics. Tilburg University (TU) in partnership with Universita Autonoma de Barcelona (UAB) the London School of Economics and Political Science (LSE) and the European University Institute (EUI) have developed a prototype digital library providing end-user access via a uniform interface to a range of information resources in the field of Economics. The project aimed to create a European Digital Library for Economics, providing users of partner libraries with mutual access to heterogeneous distributed resources of the consortium members, wherever possible giving direct access to full-text copyright and non-copyright material. It has provided a visible example of interconnected library services, integrating various functions to provide a full-scale virtual library service to end-users. Although the project focuses on the subject field of Economics, the architecture and the resource-discovery tools being developed should be entirely portable to many other disciplines and institutions.

The Decomate II project is based on the results of the successful Decomate I project. Decomate I developed an end-user system (implemented as a live service in the three participating universities) that provided secure access to copyright materials using a single bibliographic database and online storage of full-text journal articles. The Decomate II project builds on this by providing end-users access to heterogeneous copyright and non-copyright materials in a distributed network across the participating libraries, supporting access to multiple bibliographic databases and full-text resources through a single, uniform user interface. All four main partners have strong Economics departments with an international reputation. Silver Platter, as an associated partner, has provided technical support and played an intermediary role in obtaining license agreements. The Erasmus University of Rotterdam, Maastricht University and the University Libre de Bruxelles were test...
sites for the Decomate II software from the beginning of the project. During the course of the project the University of Macedonia in Greece and a number of German libraries expressed an interest in becoming test sites. Elsevier Science, Kluwer Academic Publishers and Swets & Zeitlinger were sponsoring partners, with Swets acting as an intermediary with some smaller publishers.

2 What end-users want

Several studies have been made of the requirements and preferences of academic library users for access to published material relevant to their areas of study or research. Although these reveal recognisable differences that correlate to broad types of users (undergraduates, researchers, professors), and to subject disciplines, one common demand is for consistency across the range of materials that their library provides. Their primary relationship is with one library or information service, not with many publishers or other original sources of material. They would prefer a single, simple method to find and access all of the information resources relevant to their field - with as few of those they consider irrelevant getting in their way in the process.

Another common desire is for immediate access - users "want it now!", and therefore they are keen to access electronic versions of journal articles and similar digital resources for which the full text can be immediately delivered to their desk. Many publishers, intermediaries and libraries are responding to this demand by producing proprietary gateways and interfaces for their users (or, at least, the users they hope to attract) to search for and retrieve material from their own titles or collections. No doubt the people responsible for each of these services believe that they have achieved the "best" user interface for their purpose, but the problem from the users' point of view is that they are all different interfaces and any one service will only contain a percentage of what the individual user wants. User studies indicate that a substantial quantity of high quality resources is a key factor for users in determining the value of a digital library service. Not only must the key journals in the subject area be included but there must be a sufficient number and quantity of the most frequently-used resources to encourage students and researchers to use the service. They also want these resources to be presented to them via a consistent, uniform interface with which they can become familiar.

3 The Decomate II service and content

The Decomate II model is designed to provide a solution to these user requirements. Firstly the partners aimed to include in the Decomate II service a critical mass of the core information resources in economics, whatever their source. An important early task was to investigate across the partner sites the information resources required by users. This revealed much common ground but also unearthed some resources held at only one or two partner sites but of interest to other partners, e.g. JSTOR, IBSS, RePEc. A significant advantage of this subject-based international consortium proved to be the opportunity to tap the subject and bibliographical expertise of library and academic staff across the partner sites. Once the necessary content for Decomate had been identified, the next step was to acquire cross-site access to it for all the partners. Where resources were owned
by partners, this could be organised quite easily in some cases, e.g. incorporating the
partner libraries’ catalogues in the Decomate interface. User studies showed that research
or working papers in economics from the home institution and from other universities
came high on the list of valued resources, so wherever possible these were added. It should
be noted that it is not always easy for libraries to obtain access to working papers from
their own institution when production of these is highly de-centralised. However, sharing
working papers between institutions is potentially a major benefit of digital library co-
operation.

Much of the content in the Decomate digital library model is commercially-available
copyright material. This is where the existence of a consortium of partners working to-
gether proved particularly beneficial, as well as the input of our commercial partners.
Favourable license agreements were concluded with Elsevier Science, Kluwer Academic,
Bell & Howell Information and JSTOR. These involved cross-partner inter-licensing, with,
in some cases, the supply of information providers’ bibliographic records to the Decomate
database, linking to the full text resources. It was unusual for publishers and interme-
diaries to be approached by a subject-specific consortium wishing to conclude licensing
agreements. However, the Decomate experience showed that a discipline-oriented inter-
national grouping of libraries can negotiate successfully with suppliers, focussing on a
limited range of resources in a specific field - in this case economics. The Decomate
model provides for a mix of locally-based and federated/distributed databases and doc-
ument servers, to provide end-users with streamlined access to a critical mass of subject-
specific resources. Running a database at one site and making it available to users at the
other partner sites can be an efficient and effective way of sharing resources.

4 Decomate II architecture

This paper does not attempt a detailed exposition of the internal architecture of the soft-
ware developed by Decomate II. However, it is necessary to understand a minimum of
detail about the architecture, to explain why the model chosen is potentially connectable
to many independent sources of bibliographic data, and full text documents, and poten-
tially scaleable very far beyond the partner universities and the specific subject area of
economics. In the Decomate II model, users access the Decomate server of their home in-
titution and therefore use the single gateway and interface configured by their institution.
But this server can direct their searches at many bibliographic databases in parallel, using
Z39.50 and other protocols, and can similarly give them access to many document stores,
thus improving the chances of locating for the user an electronic copy of the required full
text document.

Figure 1 shows a user of one of the Decomate II servers, from which the same query is
directed at five bibliographic targets. These may include not only bibliographic databases
maintained for use via Decomate, but also ‘third party’ bibliographic data, such as some
CD-ROM-based databases. It is likely that most full text documents will be retrieved from
the parallel document server maintained alongside a bibliographic database, but it will also
be possible to select a bibliographic record found in one database, and retrieve the correct
full text document from a different and independent source. Where a full text source is
not immediately available online within the service, Decomate II includes a document-requester from which an authorised user can initiate a request via a range of inter-library loan or document supply services for later delivery. (However, full exploitation of this document-supply-request facility has been limited within the Decomate II project, due to the lack of available article-level bibliographic cataloguing for journal titles available only in print form).

As expected, publishers and other rights-holders of full-text resources are concerned that access to them is properly managed, and restricted to licenced users only. Universities already devote enormous resources to the maintenance of management information about their staff and students. Many university libraries are also duplicating this effort to maintain patron records in their library administration systems. Rather than duplicate this data and effort again, the Authentication-Broker component of the Decomate II system is configurable to use a number of standard (and, probably, not-so-standard) existing services for such user authentication and directory information. Users can therefore authenticate their identity to Decomate with a name and password that they already know (for example, their network login), and avoid being asked again for information which they have already supplied to their university or library. Our preferred standard (amongst those covered) is Lightweight Directory Access Protocol (LDAP).

Maintenance and further development of the complex software produced by the Decomate II project is of course a non-trivial task. Recognising this, the three project partners (TU, UAB, LSE) responsible for software development have licenced Pica to exploit the software products commercially, with a commitment to resourcing further development for the benefit of the higher education and research community.

5 Economics as an appropriate subject for European co-operation

The technical achievements of the Decomate II project have been considerable, but there have been other important achievements. The Decomate model of library co-operation has a number of benefits. Economics is an international, not a national discipline, so demand for the same common core of essential resources might be expected across national
borders. It proved beneficial to share subject expertise across the partner institutions in different countries, to arrive at an understanding of the information resources to be included in the Decomate prototype of the digital library. The project investigated user behaviour and user needs in different environments with different cultural attitudes and a variety of technical and organisational situations, on a truly European-wide basis. The resulting Digital Library for Economics was designed to cope with a wide range of institutional environments, from the large-scale university at Barcelona, with high student numbers putting pressure on computer facilities to the hi-tech university library at Tilburg; from the research-led teaching environment at the LSE to individual researchers based at the European University Institute.

On the basis of sharing institutional resources and negotiating licensing agreements for copyright materials, the Decomate consortium has acquired the potential core content for what we propose to call the European Digital Economics Library (EDEL). It has also investigated and found solutions to a range of organisational, cultural and technical issues involved in developing a trans-national library consortium. Positive outcomes of the Decomate II project, as well as the development of the software, include the identification of a common core of resources in economics, the pooling and sharing of technical, bibliographic and subject-focussed expertise as well as the experience of co-operation across national boundaries. Partners gained a greater understanding of the common areas involved in providing digital library services to their users as well as the cultural and organisational differences. The consortium also experimented in conducting licensing negotiations within a specific subject field, focussing on a limited range of resources.

6 The current context of co-operation

How does a digital library service like the Decomate II consortium fit within the many national and international digital library initiatives currently being developed? In the United States the Digital Libraries Initiative Phase 2, involving the Library of Congress and the National Science Foundation as well as other organizations, has funded a wide range of digital library projects, many of them aimed at increasing the store of digitized scholarly resources. The Canadian Initiative on Digital Libraries aims to improve communication and coordination in the development of Canadian digital library resources. In the United Kingdom, first the Electronic Libraries Programme (e-Lib) and now the Distributed National Electronic Resource (DNER) has developed numerous digital library projects and services, including demonstrators and working models of the hybrid library. The British Library is developing, with IBM, a digital store to form the technical platform to support its acquisition and preservation of collection materials in digital form, together with digitised elements of its own historical collections. It will be designed using the Open Archival Information System (OAIS) reference model and will build on the work of the CEDARS digital preservation project. The Dutch national library, the Koninklijke Bibliotheek, has embarked on a similar project. In Germany the Forschungsgemeinschaft is funding the retrospective digitization of library holdings in a number of subject areas, including law and mathematics.
7 The potential for EDEL

All these large-scale national initiatives are going to greatly increase the quantity of scholarly resources available in digital form, accessible over the Web. But spare a thought for the researcher, faced with ever-growing amounts of potentially relevant information resources and in danger of suffering from information overload. We believe there is a place within the international framework for a European-wide digital library focusing on economics. There are clear benefits to the end user of a consortium of European libraries sharing resources, co-operating in negotiating license agreements and pooling technical and subject expertise to present to the user a collection of relevant, high quality resources in economics. For this reason the original partners in Decomate II have agreed, as part of their exploitation strategy, to extend their partnership to a European-wide consortium - the European Digital Economics Library (EDEL). They plan to seek at least one partner in each of the member countries of the European Union.

What would be involved in being a member of EDEL? The Decomate II software is not essential but members would need to provide some sort of software with a uniform user interface and the capacity to link with a range of heterogenous electronic resources available within the consortium. Members would also be expected to make their own institutional non-copyright resources available to partners and would have access to other partners resources and catalogues on a cross-site basis. It is expected that EDEL would enter into licensing negotiations with copyright holders of relevant information resources, to obtain beneficial agreements for consortium members. Members would be expected to maintain relevant databases of their own resources available within the consortium and to participate in initiatives to develop the EDEL concept further. We anticipate that an important component of EDEL will be mutual access to research and working papers produced by each member institution, thus encouraging communication and contact between researchers in economics. The user at an EDEL member library will be presented with relevant resources in economics, both copyright and non-copyright, across a range of media and geographical locations, via a uniform, seamless interface. To the user this will be their own personal digital library for economics.

References

Faculty-Librarian Partnerships to Teach Information Skills for the 21st Century.

Hannelore B. Rader
University of Louisville

1 Introduction
At the beginning of the 21st century we are ensconced in an information and technology explosion. There is more data available than ever before and people throughout the world are being overwhelmed by data and information. People need training to use the available data and information meaningfully and productively. Not only do individuals have to be literate, e.g. know how to read with understanding, but also they have to be information literate, e.g. possess cultural, visual, computer, technology, research and information management literacy.

In 1989 the American Library Association (ALA) Presidential Committee on Information Literacy, defined information literacy as "being able to recognize when information is needed and to have the ability to locate, evaluate and use the information needed". ¹

During the last part of the 20th century information production and availability have exploded due to the Internet and World Wide Web. The way of doing business is continuing to change. Collaboration and cooperation are important factors to help business organizations share and utilize knowledge and experience with partners, suppliers and customers. Values of organizations are changing reflecting the reliance on people, knowledge and information. Organizations and businesses are creating, sharing and utilizing knowledge and information faster and with more technology than ever before. The world economy is gravitating toward e-commerce and the workplace needs employees who are capable of working effectively in an electronic information environment. To accomplish that workers must possess necessary information skills. Such information skills can be defined as having the ability to locate information efficiently, evaluating information for a specific purpose or need, organizing information to address problems or issues, applying information skillfully to solve problems, using information to communicate skillfully and finally using information responsible to ensure productivity in the workplace.

Information skills must be learned throughout an individual’s education from kindergarten through twelfth grade and throughout higher education. In addition, every society must work on building life-long learning opportunities for all their citizens beginning at the time a person leaves the formal educational environment to enter the work force. To be an effective and productive worker in the new global information environment, each nation must review their life-long learning environments and make appropriate changes to ensure that all people have opportunities and prerequisites for life long learning. One of the most

important prerequisites for life-long learning is the possession of appropriate information skills.

In the United States and in Australia some professional organizations related to education, law, nursing and medicine are already beginning to address life-long education for their professionals and include information literacy as an important factor. In fact, in Australia Christine Bruce has expertly defined information literacy as seven distinct areas: Information technology, information sources, information process, information control, information construction, information extension and wisdom experience.

In the United States the National Forum for Information Literacy was established in 1990 to promote literacy as a means of individual empowerment within the current information society, to support and encourage grass roots initiatives and to bring together more than seventy national leaders from education and business to address information literacy concerns and effective lifelong learning. The Forum is based in Washington, D.C. http://www.infolit.org

2 Higher Education Environment

Many changes are occurring in higher education due to the knowledge-based technology and multiple advances in technology. The development of the Internet and the World Wide Web are enabling virtual education, virtual universities and virtual learning. Demands for flexible learning on the part of college-age students and life-long learners are resulting in major demands for change in higher education. Universities have always been very slow to change but a competitive learning and teaching environment and demands from funding agents for higher productivity in education are pressuring universities to evaluate and rethink themselves in terms of structure, teaching methods, curriculum and outcomes.

Regarding teaching methods, students need to be involved in more resource-based learning and should assume responsibility for locating and assessing the materials upon which they should base their learning. In the United States the American Association for Higher Education (AAHE) has been working with academic librarians and the Association of College and Research Libraries (ACRL) by establishing the TLT Group, The Teaching, Learning and Technology Affiliate of the American Association of Higher Education, for dialogue and programming related to teaching information skills. http://www.tltgroup.org

Similar efforts to address information literacy education in university settings have been addressed in Australia, China, South Africa, England, Sweden, Botswana, Mexico and others. Resource-based learning ultimately enables students to assume responsibility for their own learning and prepares them for the information-based society. Developing students to become independent learners should be a major goal for higher education.  

2 1997. Information Literacy: The Professional Issue. Proceeding of the Third National Information Literacy Conference conducted by the University of South Australia Library. University of South Australia Library, Adelaide, Australia.

3 Bruce, Ch. (1997) The Seven Faces of Information Literacy. AUSLIB Press, Adelaide, Australia.

3 Information Literacy Instruction

Academic librarians in the United States have been concerned with teaching students appropriate library and information skills throughout the 20th century. However, during the last decade of that century librarians became increasingly concerned with setting appropriate standards for teaching such skills and in 1989 they broadened the concept of library skills education to information literacy education and defined information literacy as "the ability to recognize when information is needed and to be able to locate, evaluate and use the information needed". 5 http://www.ala.org/acrl/nili/ilit1st.html

Throughout the past decade it became more and more apparent that teaching students necessary information skills would only be successful if done as part of the regular higher education curriculum and in cooperation with teaching faculty representing the spectrum of all subject areas. A progress report was issued in 1998 by the Association of College and Research Libraries (ACRL). http://www.ala.org/acrl/nili/nili.html

This report documents the progress that has been made both nationally and in specific states since the first report was issued. It also gives five new recommendations

- Work more closely with accrediting agencies
- Include information literacy in teacher education and performance expectations
- Include information literacy in librarian education and performance expectations
- Find ways to illustrate to business leaders the benefits of creating an information literate workforce
- Have more research and demonstration projects related to information literacy.

4 Information Literacy Competency Standards for Higher Education

In 2000 the Association of College and Research Libraries (ACRL) issued their document "Information Literacy Competency Standards for Higher Education" http://www.ala.org/acrl/infolit.html. This document has also been endorsed by the American Association of Higher Education (AAHE). 6

The document describes five standards, twenty-two performance indicators and eighty-seven outcome measurements summarized below:

4.1 Standard I

- The information literate student determines the nature and extent of the information needed

Performance Indicator Sample:
– The information literate student defines and articulates the need for information

Outcome Sample
– The student explores general information sources to increase familiarity with the topic

4.2 Standard II
– The information literate student assesses needed information effectively and efficiently

Performance Indicator Sample
– The student selects the most appropriate investigative methods or information retrieval system for accessing the needed information

Outcome Sample
– The student investigates benefits and applicability of various investigative methods

4.3 Standard III
– The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system

Performance Indicator Sample
– The student summarizes the main ideas to be extracted from the information gathered

Outcome Sample
– The student reads the text and selects main ideas

4.4 Standard IV
– The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose

Performance Indicator Sample
– The student applies new and prior information to the planning and creation of a particular product or performance
Outcome Sample
- The student organizes the content in a manner that supports the purposes and format of the product or performance

Performance Indicator Sample
- The student summarizes the main ideas to be extracted from the information gathered

Outcome Sample
- The student reads the text and selects main ideas

4.5 Standard V
- The information literate student understands many of the economic, legal and social issues surrounding the use of information and accesses and uses information ethically and legally

Performance Indicator Sample
- The student acknowledges the use of information sources in communicating the product or performance

Outcome Samples
- The student posts permission granted notices, as needed for copyrighted material
- The information literate student evaluates information and its sources critically and incorporates selected information into his or her knowledge base and value system

5 Faculty-Librarian Partnerships in Higher Education
The current environment in higher education is well suited to faculty-librarian partnerships. Librarians have expertise in information and know how to teach information skills in the electronic information environment. In fact, librarians have been involved in and supported resource-based learning for many years. Faculties are in need of acquiring new skills to work with the electronic information environment and to integrate that into their teaching. Librarians can help them to accomplish that. Resource-based learning is needed so that students assume responsibility for their own learning and become independent and life-long learners in the information environment. Librarians can work with faculty to implement resource-based learning in all disciplines. Academic administrators, presidents, provosts, chancellors, directors, deans, department chairs must work together with their faculties and their librarians to lead them in this important initiative to prepare students for life long learning and information literacy.
To ensure that students acquire critical thinking skills instructors must utilize active teaching and learning, by utilizing equilibration, group activity, reinforcement and feedback. Equilibration is the most important one of these components. It is a mental process, which contributes directly to the cognitive growth of the individual. In other words, new experiences are combined with previous expectations. To bring about equilibration instructors must provoke desequilibrium. Students have to solve problems to which the solution is unfamiliar and thus their equilibrium can be upset. Such situations will result in active thinking on the part of students so they discover new ideas. Related classroom activities must be managed carefully. A good way of managing this is group work. The instructor must function as facilitator, manager, expert, consultant and interpreter. Students must use this learning experience and apply it to new and different situations. Such activities will help students become critical thinkers who can apply their learning to problem solving.

Several excellent model programs for librarian-faculty collaboration to teach information skills are listed below:

Arizona: University of Arizona, The Information Literacy Project
http://dizzy.library.arizona.edu/infolit/

California: California State University San Marcos
http://library.csusm.edu/departments/ILP/

California: University of California – Berkeley
http://www.lib.berkeley.edu/TeachingLib/

Florida: Florida International University
http://www.fiu.edu/~Elibrary/il/iliprop1.html

Indiana: Earlham College
http://www.earlham.edu/~libr/about/about.htm

Kentucky: University of Louisville, Lifelong Learning Through the Libraries http://www.louisville.edu/infoliteracy

Washington: University of Washington, UWired Program: http://www.washington.edu/uwired

Wisconsin: University of Wisconsin – Parkside
http://www.uwp.edu/library/

Additional information can be found at http://www.ala.org/acrl/nili/whatis.html

Librarians and faculty can partner in a variety of ways to bring about the best educational outcomes for students in terms of life long learning and productive information use. Faculty development is an excellent area for cooperation. As faculties rethink teaching to bring technology into the classroom librarians can work with them for facilitate such new endeavors.
Distance education and e-learning are other projects, which lend themselves for cooperative ventures between faculty and librarians. In fact, librarians must work with faculty to ensure appropriate information support for distance learners especially in an environment governed by copyright and licensing issues.

6 Conclusion

Higher education and libraries are in a state of transformation in the age of information and technology. Outcome measurements for higher education including libraries are becoming the norm. Students need to acquire information skills and critical thinking skills as part of their university education so they can become productive participants in the workforce and be prepared for life-long learning. Faculties and librarians can achieve better learning outcomes in terms of critical thinking and life long learning skills if they work together on designing curricula to include appropriate courses and modules to teach information skills. Collaborations between faculty and librarians can also ensure that faculty are prepared for electronic information use, that they will be able to integrate technology into their teaching processes and that students are taught viable information skills.

References

Wireless Networks in the Library

Tero Rantala, Tapani Lehtilä, Soile Harjala, and Juhani Paananen
Tampere University of Technology

1 Introduction

Tampere University of Technology is the second largest university of technology in Finland, with a good reputation strong in research of communication technology and mobile communications.

Tampere University of Technology library has had a rapidly growing collection of networked information sources. For example there are over 3000 full-text journals available through the internet. Library started a project for wireless networks to test them in the use of students. Another perspective was to give to students a possibility to use both printed and WWW-based information sources together.

2 Wireless networks

2.1 Why wireless network?

Library is open space where people move from one place to another, and use different information sources like magazines, books and networked material. If one wants to access all of them one has to have computer. And because one moves around in the library a lot, it is natural to have computer that can be carried with. That’s why wireless network and a laptop computer is the best solution for places like libraries.

Different kinds of wireless data transfer technologies

- Mobile communication networks (GSM, NMT, GPRS, etc.)
  These technologies have can be used to transfer data, and especially GSM can be used in Finland almost anywhere. But the biggest problem is data transfer rate, because normally GSM supports only 9600 kps data transfers, which is insufficient for effective network use. And GSM is quite expensive as an data transfer technology.

- Infrared links
  Infrared links have quite high data transfer rate, but they have very limited range. Normal infrared links, that are used in office equipment have about one meter range, and they have to have direct line-of-sight so any wall will block the transmission.

- RF technology
  Many wireless networks use radio frequencies to transfer data. It is more cost effective than for example GSM network and has much bigger range than infrared links. There are two main ways to use RF-wireless network. First one is to use peer-to-peer technology, which means, that network interface cards communicate directly with each other. Second possibility is to use access point where network interface card roam to connect to network. Because radio frequencies are very strictly controlled due
to Finnish law, range of this kind of network can only be a couple of hundred meters per access point.

This kind of wireless network is compatible with existing Internet, so when the network is up and running one can only tell that it is wireless, because there is no wire to connect it to the network. Otherwise it works just like a wired network.

- **Wireless 11Mb networks are IEEE802.11b compatible.**

Abstract of IEEE802.11.b standard [1]: Changes and additions to IEEE Std 802.11, 1999 Edition are provided to support the higher rate physical layer (PHY) for operation in the 2.4 GHz band.

This means that network components like network interface cards can be used in any wireless network.

### 3 Technology used at Tampere University of Technology

#### 3.1 Access points

Our wireless network topology is infrastructural, which means that all network traffic goes through access points. Our two access points are Wavelans (nowadays Orinoco) AP-1000 access points. We use Orinoco access point manager to manage our access points. In both of our access points there is one wireless network interface card and range extender antenna. Not just any computer can connect to access point, because access is restricted to specific network interface cards, which are identified with their MAC-addresses. Access points are connected to 100Mb Ethernet-network with twisted pair.

#### 3.2 Network interface cards

We have two kinds of network interface cards. First ones that we purchased were Wavelan TURBO 11Mb Silver card. Two of these are in access point, and the others are used in laptops, all our loanable laptops use Wavelan cards. Silver card uses 64-bit key to encrypt network traffic. This encryption and the fact that joining the network is restricted makes this network quite safe.

Second network interface card that we use is Nokia C111 card. Nokia Card uses 128-bit encryption, so it is even safer than Wavelan card. Nokia card also has connectors for external antenna, and place for a smart card, which could be used to store profiles and WEP-keys.

Network is broadcasted on 2.422GHz frequency, and communication speed is 11Mb/s.

#### 3.3 Laptops

We use two kinds of laptops.

Compaq 1500 series laptops with

- 64Mb RAM
- 4G hard disk
Wireless Networks in the Library

400MHz Intel Celeron processor.
- external Mouse
- power cord
- wireless network interface card

Compaq 1750 series laptops with
- 64Mb RAM
- 6.54G hard disk
- 333MHz Intel PentiumII processor

Operating systems and programs:
- Windows NT4.0 operating system with service pack 5/6a
- Netscape Communicator 4.7x
- Microsoft Internet explorer 5.x
- Microsoft Office97
- SSH Secure Shell client
- Microsoft Visual studio 6.0 Pro
- Adobe Acrobat 4
- Real Player
- WS-ftp
- F-secure anti-virus
- Ghostscript/Ghostview.

4 Wireless Networking project in Tampere University of Technology Library

In the year 1999 we started a Wireless network project in Tampere University of Technology Library. First we purchased 17 laptop computers 2 access points, and 12 wireless network interface cards. Later we purchased 5 more network interface cards. After installation of operating systems and programs, we started testing the environment. At first we used only one access point and couple of laptops. After successful testing period we tried to find optimal locations for our two access points. After couple of tests we found location, in which access points cover almost whole library. Because of book shelves and other obstacles like walls and staircases we still have couple of small areas in which signal is too weak to maintain network connection.

After testing period it was possible to borrow laptops. There are in total 7 laptops that can be borrowed. We had also a promotional campaign so that our customers would know about this new service. We used several different ways to promote, like Usenet newsgroups, school internal bulletins and student unions newspaper. Especially students started to borrow laptops quite soon. Library staff also uses laptops with wireless network in several occasions. Some statistics about loans and results of user questionnaire will be presented in the next paragraph.
5 User experiences

User response was very positive. Main advantages were that they could do their studies in more peaceful place than computer lab and they could move around in the library where they needed. Students could choose working place which best suits their needs. They were forced to go computer laboratories, which many students considered too disturbing. Most students thought that quality of the network was good or at least sufficient though some gaps did exist in the library. Altogether students were satisfied with the project and hoped that the area should be widened outside of the library.

Staff use pattern was quite similar to the one of students. Best advantages were independence of the location and still having connection to the network. Interesting use was building a mobile computer classroom with laptops for small courses.

References

Knowledge Transfer: the UNESCO guide for developing countries on electronic theses and dissertations

Susanne Dobratz and Peter Schirmbacher
Humboldt-University Berlin Computer and Media Center

1 Introduction

The UNESCO guide on electronic theses and dissertations aims to develop standards and best practices for the creation/enhancement of electronic theses and dissertations (ETD) projects all over the world, but particularly in developing countries. The aim is to provide an online and a CD-ROM version in English, French and Spanish by April 30th, 2001.

ETDs initiatives are operating all over the world, e.g. NDLTD (http://www.ndltd.org), the project Cyberthéses (http://www.cybertheses.org), Dissertation Online (http://www.dissonline.de). Those projects have been recognized as a cost-effective and self-sustainable mechanism for modernizing IT in higher education institutions. ETD projects involve the joint participation of students, researchers, faculty, staff, administrators and librarians, as well as system and network administrators. They train students, faculty and administrative staff in libraries and media center to cope with multimedia issues. Within this several projects a number of institutions worldwide have already established guidelines for the creation and dissemination of ETDs. The partners vision, and the objective pursued by this guide is the conception and creation of an inter-related system for the distribution of theses on an international level. Researchers and students all over the world now commonly use on-line documents and resources. Far from commercial gains the real needs of students and researchers all over the world lies in the widest possible diffusion and use of research results via free access to theses through a single interface, and without institutional or geographical borders or barriers. Many projects for publishing and distributing theses are already under way around the world. The results are conclusive. Hundreds of thousands of students and researchers have already distributed their thesis, or read and used those of their colleagues. The tendency is clear. With the interest raised by the diffusion of theses on the Web, many institutions are conceiving and implementing these projects.

To collect all the experiences and to derive internationally applicable standards and best practices the UNESCO funds the preparation of a guide presenting these standards and best practices.

2 Overview of Participating Parties

Initiatives to establish and develop an “Electronic Publishing Culture” and to establish a scholarly electronic publishing are working around the world. The largest of the is the
Networked Digital Library of Theses and Dissertations (NDLTD) lead by Prof. Edward Fox from Virginia Polytechnic Institute and State University (Virginia Tech).

The concept of electronic theses and dissertations (ETDs) was first openly discussed at a 1987 meeting in Ann Arbor arranged by UMI, and attended by representatives of Virginia Tech (Ed Fox from Computer Science and Susan Bright from the Computing Center), University of Michigan, SoftQuad, and ArborText. As followup, Virginia Tech funded development of the first SGML Document Type Definition (DTD) for this purpose, by Yuri Rubinski of SoftQuad. In 1993, at the inception of the Monticello Electronic Library Project, supported by SURA and SOLINET, Professor Edward Fox of Virginia Tech became Co-Chair of its Working Group on Theses, Technical Reports and Dissertations. In 1994 SURA funded a workshop at Virginia Tech to develop plans for electronic theses and dissertations (ETDs), selecting Adobe’s Portable Document Format (PDF) and the Standard Generalized Markup Language (SGML) for representation and archiving. To help implement these plans, SURA has funded a research, development, and dissemination effort based at Virginia Tech for 1996. (from the description of the WWW-page of NDLTD)

The main goals of the NDLTD initiative are:

- to enable universities to set up digital libraries, by collecting, cataloguing, archiving, and providing access to electronic theses and dissertations worldwide,
- therefore it is essential that universities discover their potential of their intellectual property and productions, and that universities learn to use and share them,
- to improve university education by effectively sharing technology and knowledge, because progress in science is speeding up. Universities can only keep up with this progress if they use graduate research results and make them more readily and more completely available.
- to enable students to use new technologies and learn about electronic publishing and digital libraries, getting used to new media and technologies for performing their research and spreading their results.

Virginia Tech agreed to finance further development in 1991. Since 1992 Virginia Tech has worked with the Coalition for Networked Information (CNI), the Council of Graduate Schools (CGS), UMI and other interested organizations, helping run a series of design and discussion meetings. Additionally, the University Library’s Scholarly Communications Project developed the procedures and systems for processing, archiving, and providing public access to Virginia Tech’s graduate research works. So the locally started project at Virginia Tech began to spread out throughout the USA and the whole world, becoming the Networked Digital Library of Theses and Dissertations.

A similar initiative covering the French-speaking world is the Cybetheses.org Project, which was originally started by the University of Montreal and the University of Lyon 2. In 1998, the Université de Montréal, along with Université Lumière Lyon2 and Université Senghor, obtained a grant from the Fonds Francophone des infonetz (FFI). A transfer of expertise toward Lyon2 thus occurred in 1999 and our collaboration resulted in the Cyberthèses programme (http://www.cybertheses.org). Thanks to a second FFI grant,

1 http://www.ndltd.org
these same institutions will soon undertake the production of documentation and of various pedagogical tools in order to hold training workshops in 2001.

Initiatives in Australia, India and South-America followed. The Australian Digital Library project adapted an early version of the software from Virginia Tech support both university and national level ETD programs.

For Indian, the University of Mysore, VIDYANIDHI, plans that Mysore University should evolve into a National Centre for ETDs. The Centre at Mysore will eventually develop guidelines for all the issues related to electronic theses and dissertations. The University of Mysore has to deal with a lot of India specific problems, such as typical problems of developing countries, especially: multi-language and multi-script requirements, other diversities in ETD content; developing search interfaces in regional languages; issues relating to metadata in the languages and scripts of the item.

For Latin America ISTEC is engaged in a number of projects throughout Latin America related to libraries, and is now preparing a small booklet on digital libraries for the region, supported in part by the Organization of American States. ISTEC will coordinate efforts on the Guide related to the Spanish language, with assistance from other colleagues such as in Mexico and Spain. ISTEC will translate the Guide into Spanish and promote the concept in Latin America and Spanish-speaking countries.

In Europe we have a quite different situation. Here huge initiatives are barely to be found. Electronic Publishing of Theses and Dissertations is mostly been seen as the own duty of every single university. So the German initiative "Dissertation Online" is one of the most prominent projects within Europe. In 1996 four German learned societies - comprising the fields of chemistry, informatics, mathematics, and physics - signed a formal agreement to collaborate in developing and using digital information and communication technologies (ICT) for their members, scientific authors and readers. Since that day several other societies joined. Within this initiative since 1998, a Germany-wide project "Dissertation Online" (http://www.educat.hu-berlin.de/diss_online) has been up and running. The learned societies involved in the project include chemistry, computer science, education, mathematics, and physics, and five German universities as well as computing centers, libraries and the German National Library (DDB). The original project was directed by Prof. Diepold of Humboldt University, Berlin. Within this project several technologies for processing electronic dissertations at universities were developed. A major focus was on development of extended course materials for authors, library staff and computing centres in order to give instructions to other university libraries on how to build up a document server and a university electronic dissertations service. The Course materials (booklets, software, a small video presentation) for librarians are available via a dissertation portal and information system called DissOnline.de (http://www.dissonline.de). At the end of the active sponsoring part of the project, the German National Library (http://www.ddb.de) has taken the responsibility for governing further activities in Germany within this field. The following partners are working on the guide:

– Virginia Polytechnic Institute and State University (Virginia Tech) (USA)
– University of Montreal (Canada)
3 Contents of the Guide

The Guide will be a next generation version of WWW pages and other content that has evolved over the last four years by groups around the world that are connected with NDLTD. Some is targeted toward various individuals:

- students (preparing ETDs),
- staff (assisting students, or handling systems and services),
- faculty (guiding students, and discussing issues such as copyright).

At another level, Guide content addresses campus infrastructure:

- campus decisions and plans regarding working with ETDs,
- engineering compromises such as between training/assisting students with standards like XML or incurring higher costs for long-term archiving,
- organizational issues such as what to undertake vs. what to outsource or collaborate on.

Generally spoken, the Guide shall motivate students, faculty, staff, campuses, and nations to establish programs and projects for the writing and dissemination of scholarly electronic resources. It should give support to developing countries through transferring ideas, principles and technology and make it therefore easy for those countries to establish a program on a campus or a country. The guide shall clarify choices of technology and implementations by showing the implications of each alternative, and which ones work.

The Guide covers the following aspects:

- Hard and software requirements
- Network requirements
- Legal requirements
- Data formats
- Metadata
- Archiving
- Access tools
- Model workflow
- Establishment of budget
- Proposals for funding for projects
The first chapter gives an introduction to the genre itself and an overview on ETD initiatives worldwide. It focuses on explaining purpose, goals, objectives of ETD activities and how a help for students to become better prepared as knowledge workers and how to ETDs can improve graduate education, and quality as well as expressiveness of ETDs. The Guide will report on the increasing readership of ETDs, it will show that communicating research results via this way is most successful. It will describe how universities can develop digital library services & infrastructures and which advantages an increase of sharing and collaboration among universities and students will bring for everybody in this context. The first chapter will give an brief overview about the history of ETD activities: 1987-2001 and existing global cooperations and how they can be enlarged in order to give support for developing countries.

The second chapter aims especially towards the support for students. It motivates them to participate within local ETD projects and explains the benefits for students. Those are e.g. to minimise duplication of efforts, to improve visibility and to accelerate workflow and to use and access other scientists electronic resources within a global digital library. It will report on well known sites/resources for ETDs:http://www.theses.org,http://www.cybertheses.org http://www.dissonline.org, UMI. Within the second chapter the use of retrieval interfaces and mechanisms, the use of classification systems, classification schemes used in different disciplines, the importance of satisfying local requirements will be described aimed at the students point of view. The usage of different word processing systems in order to receive archivable, searchable and internet readable electronic documents will be shown. The preparation of multimedia documents, the handling of the copyright for authors will be explained to students.

The third chapter is particularly aimed towards universities administratives. Here reasons and strategies for archiving electronic theses and dissertations are described and proposals on how to develop an ETD program either locally or on a nationwide or cooperative level (steps, process, collaboration with other institutions, stakeholders) are made. Sample scenarios illustrate different approaches, schedules and workflows to the topic. The third chapter will point out the role of the Graduate School and a graduate program for ETDs, it will consider the role of the library and archives, as well as computing centres. Key concerns and their reasons such as intellectual property rights, relations with publishers will be put into the focus of decision makers at universities. The amount of human resources and expertise needed for an ETD program, as well as sources of funding and an overview of the costs and budgets for such a program are put into the discussion.

The fourth chapter deals with the overall technical issues and will point to existing tools and sites, which are freely available or commercially sold. Here the desired and necessary technical infrastructure (networking, hardware considerations, software considerations) will be examined within different contexts: local, regional, national, global. The production side of ETDs will be covered, regarding the hardware and software needed, how multimedia comes into the game and which scripts and encodings are available. A major part will focus on the problem of document representations conversions, it will give an overview of page description languages, such as Postscript and PDF, on how to handle links, bookmarks, thumbnails, as well as an introduction to markup languages such as SGML/ XML and point to software solutions and DTDs for ETDs. It will explain how
to write directly in XML or how to use conversion strategies, tools and rendering-style sheets. Further technologies for metadata, cross walks between different metadata systems, encryption and watermarking, packaging and post processing of ETDs, checking of ETDs, problems of authentication, version control, as well as backup strategies and mirroring technologies are described. Systems for the dissemination of ETDs, such as identifying systems (URN, PURL, DOI), metadata models for ETDs, cataloguing systems (MARC, DC, RDF), database and information retrieval issues (Packaged solutions, NCSTRL, Library Automation/OPAC, Harvest usage, other search engines) are all in the scope of this chapter.

Chapter 5 explains which steps have to be taken in order to educate the staff of universities to enable them to cope with these new technologies. It will emphasize the importance of collaboration, local team work and the usage of standards.

The final chapter then looks into the future: how can ETD initiatives like NDLTD be expanded, how can the whole world of scholarly communication be integrated, how can technology changes be managed and interoperability guaranteed. The importance of initiative like the Open Archives Initiative is pointed out. The future vision is given by Edward Fox, the founder of NDLTD:

"In the future, NDLTD plans to offer an increased set of services - not just search but also browsing, annotation, and selective dissemination of information (i.e., routing according to profiles). Searching against millions of works will need to be supported by tools for handling full-text, multimedia content-based matching, query by example, and other approaches. Additional mechanisms for preservation, agreements to enhance performance through mirroring, and flexible handling of works in many of the world's languages will all be needed. Continual evaluation and refinement of services, tailored training and education, and increased sharing and collaboration should help ensure ongoing improvement and eventual fulfillment of the many goals and objectives of ETD programs. We invite you to learn, participate, and contribute to this cooperative venture!" at http://www.digitalmediainstitute.org/unesco/.
An Environment for Processing Compound Media Streams
- Work in progress paper V 2.0 -

B. Feustel, A. Kárpáti, T. Rack, and T.C. Schmidt
Computer Centre, Fachhochschule für Technik und Wirtschaft Berlin

Preface
Today’s standards of internet-connected computers provide easy, intuitive access to multimedia information documents within classrooms as well as students homes and thereby confront students as well as teachers with a new paradigm of knowledge transfer: Not only the offer of an unfiltered totality of the present (rapidly changing) knowledge requests for continuous (network) access, but also a formerly unknown multitude of presentation methods to the lecture hall or - in the framework of teleteaching - to students homes has come around. Nothing since the invention of blackboard and chalk, we are tempted to claim, has revolutionized teaching in a more fundamental way than networked multimedia.

Consequently web-based teleteaching and distant learning offers are by now seriously considered parts of the educational system and gain increasing importance. But by preparing educational applications the insufficiency of approaches purely grounded on html-style technologies becomes more and more evident: Design and maintenance of a website approximately reflecting the complexity of an interactive online course is on the one hand an experience of little practicability. On the other hand information streams formed of time-based media or continuously online processed data hardly incorporate into a stateless presentation layer. Consequently a growing awareness for the demand of better information models can be presently observed within the community of educational computing [1],[3].

Learning modules request for a coherent design of interrelated portions of information being at the same time subject to structural subdivisions regarding thematic aspects such as topic, subtopic, related field etc., didactic classifications concerning complexity, order, relevance to the objective, etc., presentational attributes like positions in space and time, display contexts, … and finally meta information regarding format, author, access rights etc. The meaningful shaping of such structural overlays belongs to the author. Therefore a desirable information system not only should exhibit capabilities of embedding its contents into flexible structuring but also needs to strongly support the process of authoring in accordance to its abilities, unique points of source editing being the most prominent feature under request.

Of equal relevance appears the support of multimedia data. Different types of media such as text, images, animations interplaying with time-based material i.e. audio, video or online data processing request for an individual specialized treatment which for the non technical oriented author is hard to fulfil. In recent times it has been widely understood that the preparation of qualitative advanced multimedia material ranges far beyond the scope
of individual lecturers. Facing the demand for good multimedia supplements in teaching on the one hand and recognising the difficulties in the production of such material a ‘marketplace’-type idea of exchange and reuse appears quite natural in multimedia supported teaching.

Teaching has to account for perception being a time-dependent process. The important notion of time in teaching is one major reason for drawing a lot of attention in recent research works to World Wide Web techniques which distribute multimedia documents with temporal and spatial relations. In addition the growing demand for synchronized handling of time-based media such as video and audio serves as a general motive for introducing temporal aspects to the Web. Finally, streaming data sources invent a new level of scalability by accounting for transport timing and therefore rapidly gain quantitative importance throughout the internet.

In this paper we present ongoing work on an environment grounded on an object oriented multimedia information model. Residing in a database management system media objects can combine to form complex documents by means of an active document structuring, allowing for temporal and event-type inter-object relations. The environmental basis is employed for the Media Objects in Time time-based runtime environment as well as in further teaching applications. All components together allow for composing complex teaching applications from media objects and streaming them to the Web.

This paper is organized as follows. In section 2 we introduce the basic ideas of our Media Object Model and exemplarily compare to related works. Section 3 presents the underlying multimedia database system and introduces to its authoring toolset. Principles, architecture and implementation properties of the MobiIT runtime environment will be discussed in section 4. A brief introduction to further applications is given in section 5. Finally, section 6 is dedicated to conclusions and an outlook on the ongoing work.

1 The Media Object Model and related Works

1.1 Enabling active Document Structures

The teaching and presentation environment introduced here aims at the one hand at profoundly supporting arbitrary media data including time-based material. On the other hand we want to provide a flexible mechanism for structuring documents which not only accounts for thematic interrelations (e.g. links), but also gives rise to object compositions including temporal aspects or complex interaction events. Thus led by our object model and guided by its web authoring toolset an author should be able to produce for instance a multimedia information stream being the composite of any heterogeneous collection of media data (text blocks, audio, images, video, ...).

Central to our object oriented information model therefore is the notion of active references as a basic composition mechanism. These interrelations not only carry the ability to refer to subordinate presentation data, but are capable of imposing event-type actions on its references. As typical notions of referential actions between documents we consider the connections in time and (presentation-) space or the predefinition of possible user interactions. Since these active references are foreseen in the data object model authors may
by a simple editing of attributes build up a document structure which inherits some active processing from its information object class. The individual mark-up of active document structuring is defined with the design of an educational application. Structuring process has been kept very flexible to permit application-oriented, semantically meanings, thereby donating intuition to authors when dealing with the system.

As pointed out above an important role is dedicated to the reusability of document data. As it is of course easy to assure multiple exploitability of simple media files, reusability of complex, composite media documents is of much higher importance. These collections of interrelated documents usually play the role of knowledge modules and bury significant amounts of authoring work. They are also subject to singular change, depending on the knowledge evolution. Our model does support for reusable presentation components by providing a uniform, media independent data structure which we denote by Media Objects. Mobs serve as universal containers for embedding either subsequent Mobs or media data. By referencing one another Mobs allow for arbitrary compositions of unlimited complexity, where the atomic nodes of the resulting graph structure are formed by distinct Data Objects. Besides its uniform appearance the Media Object entities support for application reuse in restricting active links to referenced objects thereby relying on referential integrity ensured by the underlying database system.

1.2 Media Objects

Media Objects may be seen as the central constituents to comprise the data structure of our object model. As the basic design idea a Mob consists of both, the subordinate reference list and the collection of active references, the latter being restricted to act on Mobs included in the reference list. Simultaneously arbitrary annotations may stick to these hulls, neutral with respect to applications or actual media data.

Defining an application at first requests for turning the Mob structure into a meaningful formation. Semantics can be brought onto Mobs in a twofold fashion: Dynamic content processing may ground on (mandatory) attributes assigned to the data and thereby organize content according to meta information. Media objects in this first step remain singular informational units. The powerful approach however lies in interpreting the active references native to Mobs. An application designer not only can choose from arbitrary interelations such as trees, Petri-nets, circuits, . . . , but can dedicate operative instructions to those data links ranging from a simple automated Web-link generation over spatial and temporal construction policies up to conditional interactions within arbitrary scenes.

1.3 Related Works

Enumerous activities rank around document structuring and authoring of more complex information models than HTML-formatting. From the educational area we exemplarily mention the group of Maurer [3],[4], who propose and implemented the Hypermedia Composite Model as a semantic container for learning documents. Even richer research is going on in the area of multimedia database systems. For an excellent overview we refer to [6].

As mentioned earlier several interesting research activities are presently enforcing the notion of time to the Web, the most prominent being the W3C recommendation Synchronized
Multimedia Integration Language (SMIL) [10]. As a declarative language SMIL allows for synchronization of media objects in an somewhat simplistic, HTML-style fashion. Synchronization is done in object pairs, either sequential or in parallel. The appearance of any object may be bound to a duration parameter. SMIL extends the meaning of hyperlink to connecting temporal and spatial subregions.

The runtime behavior of any SMIL interpreter thereby is more or less left open, which probably is the most important drawback of the model. Combined with the absence of a stringent handling of timelines temporal inconsistencies in more complex documents can be foreseen. Besides few reference implementations of SMIL players there is an attempt to include synchronization features into the Web browser named HTML+TIME [11]. This proposal addresses temporal extensions to HTML and incorporates basic elements of SMIL.

Both ideas however suffer from strong limitations due to the simplistic ansatz of HTML omitting any structuring for media object use. Rutledge et al [12] consequently report about severe difficulties in authoring SMIL presentations mainly due to the lack of reusability for object compositions as well as SMIL's inability to deal with complex object relations. In most recent works, the 2.0 specification of SMIL [10], the World Wide Web Consortium heads towards a realization of SMIL as a module within the framework of the XHTML language. Most of this work is presently ongoing and far too incomplete from permitting implementations.

As a completely other example more similar to our work we like to mention the Nested Context Model (NCM) of Soares et. al. [13]. With the aim of grounding a strong structure for flexible deployment of hypermedia documents the NCM provides a composite meta-structuring for different media types, called nodes, up to an arbitrary level of complexity. Those nodes may contain a reference list of denoted nodes giving rise to an arbitrary graph structure of the composed document. The model, which has been implemented in a system called HyperProp, treats hypermedia documents essentially as passive data structures. Synchronizations define through events which may occur as the result of object presentation or user interaction.

Since embedding of media objects within the NCM results in a passive mesh without further presentational meaning, an additional structure of activation, events and contexts (called perspectives), has to be superimposed. This characteristic on one hand leaves some liberty to the author (the same object structure may encounter different behavior in different contexts), on the other hand it adds an additional level of complexity to the modeled hypermedia system and denotes the major difference to our work.

2 MIR - A Media Information Repository

2.1 The Media Object Database System

The core of our multimedia environment is formed by a media object database system. Named Media Information Repository (MIR) it combines all operations related to data storage and at the same time keeps track of information structuring ensuring referential integrity. Although MIR fully implements the media object model it remains neutral with
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With respect to applications built on top of the database layer. The intention in designing the media repository was to provide a robust, powerful basis, on which a multitude of educational systems may be established with rather limited effort.

MIR divides into two functional groups: The Media Object Lattice and the Data Store (s. fig 1). Objects in both repositories may be addressed by symbolic names embedded in a virtual file system. Besides administrative information concerning owner, group and access rights data entities can carry arbitrary annotations by means of an open property list. Technically only distinct by data type definitions properties may contain any kind of meta information, e.g. content descriptors such as subjects and keywords, didactic annotators concerning presentation order or information depth, and technical markers being specific to the educational applications on top of the database, as well.

![Figure 1: Media Object Database Architecture](image)

Media entities in our object oriented database design belong to classes, which define their properties. Any object instantiates the class its derived from and thereby inherits the property set including type and attribute definitions. Customisation of the MIR to support a new application thus limits to the set-up of appropriate object classes with the possible need for extending authoring functions (see below). Quite independent of actual exploitation the universal data structure MOB is offered for application processing.

As an advantage of the MIR data logic actual media handling separates completely from application design: The Data Objects (DOBs) reside in a Data Store together with its media descriptors, resp. mime-types. They are ready for multiple access by either MOB-based applications or directly through http-requests, where media specific treatment has to be taken care of by clients and - if necessary - by middleware components independent of the actual application.
2.2 The MIR Authoring Environment

Easy access for authors the system grants through a Web authoring tool. It is designed to guide through the different levels of complexity by means of several adapted views. As it is well known and to some extend obvious that the WYSIWYG paradigm does not hold in the case of temporal, structural or event editing [5], we attempt to relate the multiple aspects of authoring to specific, intuitive appearances of the tool, thereby relying on the semantics of structural relations mentioned above. Application design by means of an object class editor though carries no presentational meaning and remains rather formal as its use might be restricted to technical staff.

At the first stage of content authoring our tool allows for DOB upload and control. Guided by an object browser the author may organize and retrieve objects in a directory structure of a virtual file system, donate names, media types and properties to the dobs and upload actual data to the MIR data store (s. fig. 2). In general media data manipulation is not meant to be part of the application authoring process, but for the sake of simplicity a simple text editor which also supports for HTML-formatting is included in the system and permits the direct generation of written text.

Whereas the object browser in the MOB editing regime remains unchanged, dedicated support is given to the author in designing presentations. With the help of a structure view, a spatial view and an (relative) object timeline authoring of MOB-based applications receives its basic instruments. As was pointed out above, however, the specific semantic of media object structures is only fixed with application layout. The authoring requirements thus may significantly change between different fields of use and specific aspects cannot be foreseen in general. Including a toolbox of methods our open system therefore provides a programming interface to allow for easy, application dependent extensions in the form of specific views.

2.3 Architecture and Implementation

The technical concept of the MIR environment is formed by an open multimedia architecture designed according to a 3-tiered principle as is shown in fig. 3. Implementation thereby followed the major goals

- **Functionality**: The environment - meant as a uniform platform for media object processing - must provide all fundamental operations on MOBs and DOBs like load, store, search etc.
- **Flexible Media Handling**: The system must adapt to a general range of possible media types including discrete and continuous objects.
- **Standard Conformance**: All used or implemented components should conform to present standards established. User or application interfaces should rely as far as possible on application standards s.a. the Web protocol, mime-type handling, streaming protocol standards etc.
- **Performance**: According to well known resource requirements of (continuous) media data specific measures concerning leanness, optimization and scalability of the system should be applied.
- **Encapsulation**: Access to media object data should only be granted by a set of appropriate, general operations, thereby hiding low level manipulations such as SQL-statements.

- **Extensibility**: Characteristics of applications as well as additional media types can be expected to impose specific requirements to the environment. Besides a uniformly suitable data environment application and media processing units need to offer universal programming interfaces for adding the requested capabilities to the system.

The current implementation of the media object database runs in a relational database management engine, a Sybase adaptive server, with special tuning applied to it. This platform we chose as a robust, very fast and lean basis. For the sake of encapsulation and performance, but also to achieve an ‘object oriented’ data modelling all data accesses and manipulations are realised by means of stored procedures. Media specific operations such as compression/decompression, streaming or synchronisation tasks are performed by the middleware components, since middleware services are scalable, support load balancing and in our case accommodate caching.

All middleware components are written in JAVA and are primarily responsible for the session and transaction management and for a buffering cache layer which allows for latency hiding. Even though we employ a single component server solution, the Sybase Jaguar, most of the implementations fulfil the JAVA EJB specification and are therefore rather neutral with respect to the specific product. Client access is granted in a manifold way (s. fig. 3): On the standard side the natural IIOP-exchange of objects is offered to intelligent client apps complemented by standard Web protocol http for all public entities in the database, the latter being implemented by a servlet in the back of an apache/tomcat.
installation. As serialisation of binary large objects forms an inefficient way of transport we decided to incorporate the Sybase proprietary transaction protocol TDS, which shuffles binary data in bulk. The client programming interface for TDS-transport is hidden behind JDBC, so that proprietary code can be kept from application programming.

Figure 3: Networked Architecture

As an important feature of the platform introduced here may be seen its ability to deal with pluggable subservers (s. fig. 4). Subserving not only opens up the field for application dependent media streams, but also allows for incorporation of new, complex functionality such as online data processing without fattening a thin applet client. For an overall stream oriented system it appears quite natural to include served media for streaming and such. MIR provides a flexible and simple interface for this purpose. In current applications subservers are used to incorporate the high performance optimized JAVA Wavelet video player of Cycon et al [7], a direct text sender which permits messaging to ongoing presentations and an MPEG3 server which processes audio.

The interface to include any type of subserver has been purposely designed in minimal fashion: Any subserver in perspective must implement the methods getPortCount to allow for inquiry on requested number of ports, setPorts to permit port assignment, setData to receive data handles and the initialization. Additional information classes etc. are kept
optional. The interface at the corresponding client site appeals as even simpler: setServerInfo and getServerInfo are the methods needed here. Within this open framework it should be easy to bring additional data servers to the system as for instance to include real-time visualization or live streams or . . .

Implementations on the client side merely depend on application complexity than on guidelines taken from MIR environment: Clients may be applets based in Swing like our authoring tool, simple HTML-pages or Servlets running JAVA Beans in correspondence to JAVA Server Pages. Any time-based application we however have not undertaken without browser’s JAVA machine.

3 Media Objects in Time

3.1 Presenting a media stream

As one major application the teaching and presentation system Media Objects in Time (MobIT) centres about the idea of media objects synchronizable in time which may be linked to form fairly complex presentations. But at the same time any object remains self consistent and of independent use. Roughly speaking our basic concept consists of defining media object instances and lining them up in time as is shown in figure 5. MobIt intends to provide an accurate scheme for temporal and spatial placement of presentation objects, where authors neither have to take care of interobject synchronization dependencies nor adaptation to possibly inaccurate network performance, the latter being subject to implementation of latency hiding techniques.
Presenting itself on a timeline any presentation becomes a time-based data object, even if composed only from timeless media such as texts or images. Any presentation component will carry an instance of initial appearance and a moment (possibly at infinitum) for fading away from the client’s screen. Within this framework of MIR any streaming media such as video or audio may be included and synchronized to the scene and the overall data stream.

Aiming at the combined utilisation in lecture rooms as well as teleteaching our model focuses on a clear, straightforward concept of reusable compound media components. Any of these will be accompanied by screenplay scripts arranging their behaviour in space and time. Thus in place of the page oriented WWW concept or the typically event driven nature of CBT products MobIT runs as a flow oriented presentation model showing for example a crash-test video combined with charts of relevant statistics and vocally explained CAD car models in subsequence.

3.2 The Compound Flow Model

In designing an educational system within our environment structuring has to be given an applicational meaning. In the context of MobIT this is done by the Compound Flow Model (CFM), which takes much care to define a simple structure of straight forward logic intuitively appealing to document authors. The CFM organises the uniform hull entity Mob in a tree structure, where any branch reference expresses a temporal and spatial inclusion relation. (s. figure 6).

Media objects form the central construction element of the CFM data structure. As bound to the basic design idea of MIR Mob includes the subordinate object reference list and a screenplay script acting on the references, thereby describing all parameters responsible for their behaviour in time and space. Those scripts we denote as Playlists. Playlists describe the states attained by the corresponding Mobs in total.
Tightly bound to the concept of combined reference to objects and their states is the notion of generalized reusability for any component involved. Roughly speaking an object exhibits generalized reusability, if and only if it is self-consistent, i.e., free of recursions, and parametrizable in state space. The fundamental parameters of the state space up until now are the spatial size and the duration in time. Some additional features such as background color or font type change have been implemented.

Vital to the framework of CFM is an environment for generating and controlling the flow. As media objects for a given presentation may be widely branched, each one of them equipped with a complex structural inheritance and its own synchronization demands, a flow control module needs to resolve all structural data dependencies. It thereafter has to linearize resulting bulk information, to form an ordered flow and at last add objects to the externally provided primary timer.

Even though components of the Model are of active, self-consistent nature an additional flow generator needs to be present. Generating a flow in our context has to fulfill the task of resolving all open object dependencies, collecting the data and en passant performing co-ordinate transforms and at the core linearize data with respect to time. As a result of such linear alignment all playlists are merged to form a complete script for the screenplay the whole presentation consists of. Additionally may be observed that the flow generator as described is - if properly implemented - well suitable for transmitting presentations data collection as a sequential stream over the network. For a more detailed description of the MobIT application see [2].
4 Further Applications

4.1 Virtual Design

The design studio of tomorrow will not contain a computer anymore, but will consist of the computer network. Guided by this maxim a completely different idea of computer based educational system has been developed in collaboration with Bildo Akademie für Kunst und Medien Berlin. Interactive picture networking has been adopted as a basic co-operative internet platform for designers of digital images [8],[9]. The project has been honoured in the meanwhile with the "New Talents Award" at the direct marketing congress DIMA in Düsseldorf 1998 and the special price Multimedia Transfer at Learntec 2000.

People from art and design communicate through their visual products. As it is rather difficult to circumscribe representational and aesthetic contents in standard language terms, a specific way of expression needs to be utilized: A Language of Pictures. Like any stream of statements such a visual speech needs basic order principals, a timeline and thematic assignments at minimal.

The Virtual Design project started from the idea of supplying a networked communication platform which allows for creation of visual dialogs. Starting from a "white canvas" each participant is enabled to contribute data sets consisting of an image, a title and a textual commentary to the system. The system itself requests such contributions to be a reaction of a former entry. It thereby links entities and lines pictures in time chains, optionally branching at nodes which invoked multiple reactions. As time evolves the Virtual Design system will give rise to a tree of pictures with each branch representing a visual dialog between authors (s fig. 7).

Figure 7: Virtual Design Visual Navigator
Relying on MIR basic environment Virtual Design MOBs enclose images, thumbnails and textual complements. The media object structure in the virtual design application is defined by the virtual dialogs performed by using the system and is assigned automatically as part of the work process. Note that no separate authoring is needed since VD combines workspace and presentation.

4.2 Knowledge Café

As a third, much simpler application of the MIR data environment we want to introduce a small knowledge café prototype. The system ranks around pieces of information which are classified according to topics and keywords and with respect to information complexity, as well. Generating content-based meshes from Mob references the information repository not only is able to answer property related searches but will dynamically present document groups as Mob references are automatically transformed into Web links. With the use of JSP-techniques this useful application could be developed in a very limited number of days by relying on the strength of the MIR technology basis.

5 Conclusions and outlook

The multimedia information technology presented in this paper is an ongoing project in many ways: Having accomplished an efficient basic solution on structured media processing several teaching applications to be used either in the lecture hall or at students homes are to be implemented. Most exciting however we consider future developments in the area of time-based learning and presentation system.

Much work however has to be done in this ongoing project. Interactions have not been defined in CFM yet. As simple smil-type hyperlinks in our flow oriented model could only support hopping between - possibly nested - parallel timelines and as we do not intend to produce some sort of interaction programming language, our current activities concentrate on modeling an interaction paradigm. Accounting for the CFM potential to operate on self consistent media objects we are aiming at a small ‘alphabet’ of operations which enables authors to open up an unlimited number of navigational paths to the receptor with only a limited number of interactions defined.

Interactions will introduce an additional complexity to the treatment of network behavior as they might contradict latency hiding techniques in some parts. This is unavoidably true for user dialog elements. For the loading of binary large elements a careful time control will be needed. The buffered pre-reading of MObs however may be viewed as filling an instruction cache of a processing unit. Interactions impose branches to the instruction flow and can be buffered in parallel so that immediate system response generalizes.

Acknowledgements

We would like to thank Hans Cycon and his group for enjoyable co-operation. They developed the highly optimized Wavelet Video algorithms and the codec. Mark Palkow carefully ported the codec to JAVA.
References


Virtual Library as an educational tool for information specialists

Ktarzyna Millenia Żurawska and Bronisław Żurawski

Library and Information Science Department, Nicholas Copernicus University

Preface
The conditions of work are changing very rapidly in the modern society. Those phenomena have various aspects. First of all one observe that the knowledge in many professions loose its actuality very fast. Moreover the period, in which the knowledge is up to date, grows shorter and shorter. Another observation one can notice that in the information society the probability to work in one place and doing the same things in whole productive live is rather very small. One should expect that it would be necessary to change the job and profession three or more times in live.

To be competitive on the job market one should constantly improve his/her skills and knowledge. Therefore nowadays permanent education and especially self-education plays increasing role in preparing employees for their tasks.

There already exist many forms of education. The main is learning at the various types of schools and courses organized by different institutions and organisations. However, there are many economical limitations for such education on the large scale. Therefore very promising are the possibilities, which one can reach by learning the knowledge on the WWW pages. So the WWW system with its resources collected in various types of virtual libraries, virtual universities and virtual schools become more and more important in education.

Especially the permanent-education and self-education will play the leading role among the variety types of acquiring new knowledge [1]. Virtual libraries with educational resources will become one of the necessary tools in all teaching and learning processes [2], [3]. That was noticed in many educational institutions. The works on creation such libraries for educational purposes or even the whole educational systems, virtual schools and virtual universities were taken up [4], [5], [6].

Their functioning are much more cheaper than any conventional education institution. Even if they are organised on a commercial basis, the access to knowledge collected in such virtual institution is less expensive than in classical ones.

In distance education the special attention is devoted to appropriate and easy accessible information sources. The success in acquiring knowledge in virtual education depends on many factors: an access to well-prepared educational materials and circumstances, in which the learning process take place. The network tools and resources give the new possibilities in that field. Especially the usage of Virtual Libraries with educational resources is very helpful.

In the majority of documents there are descriptions of the knowledge resources of virtual libraries or various types of virtual schools. There is a lack of papers describing the process
of their creation, the problems faced during preparation of didactic materials, construction of virtual libraries and experiences in their usage in education. To some extend it is understandable because there are many publications about the concepts and projects of such libraries but there are very few realizations.

In the processes connected with all mentioned above changes in the information society the special role should play the information specialists. Therefore it will be reasonable to start and make the tests on new technology and new methods of education of such specialists.

This kind of specialists will be responsible for creation the virtual libraries and all the tools necessary in such type of education, whereas the task to create didactic materials will belong to the teachers of various field of knowledge.

To test the new educational tools, the project in this field has been started. The construction of a virtual library with educational resources and tests of its usefulness in various types of education is included in the project.

The aim of the library with educational resources is to assure and promote, in due time and in appropriate manner, an access to information sources, which are necessary for achievement the best results in teaching and learning.

In the course of realization of our project we noticed that there are a lot of problems, which occurred during creation of such virtual library. During selection of documents the special attention should be paid not only on their contents but also on the form. They should be written in the appropriate language and contain the adequate illustrations. The other problems are connected with the organization of such a library.

1 Virtual library with educational resources

Our project consist of work on the structure of virtual library, tools for creating the educational documents as well as the rules, which should be preserved while writing them. However before starting to build the virtual library with educational resources some definitions had to be stated precisely. First of all the mining of term virtual library should be clear.

1.1 Virtual Library

To our purposes we assumed that Virtual Library is a collection of resources available on one or more computer systems, where a single interface or entry point to the collections is provided. The key point being that the user need not know where particular resources are located – the location is "virtual". By application of Internet, and the digitization, any user can use, search, retrieve and access and delivery the service, material, etc. resources by network.

The Virtual Library has the following functions and components:

- should be a collection of electronic documents not necessarily placed on one server
  - in our case the Web pages,
- should contain the catalogue of that pages,
should have the software which guarantee the information server functions.

In our case the "collection" consists of the educational resources.

1.2 Educational resources

Before creation of Virtual Library with educational resources the following assumptions about its contents were done:

- it consists of didactic materials, connected with various subjects of Library Information Science studies, prepared by the staff of Nicholas Copernicus University Library and Information Science Department,
- there are links to sources already existing in the Internet (encyclopedias, dictionaries, the other virtual libraries etc.),
- there are methodical instructions for the library users.

The above documents, mainly in the WWW pages format, and lists of links we will treat as our educational resources.

The catalogues of above resources and other tools and software, databases are treated as components of the library.

2 Problems

There were a lot of problems, which occurred during creation of our virtual library. They may be divided to the following groups:

- concerning the structure of the library,
- connected with the selection of appropriate tools for creation and managing it,
- those which appeared during selection of a knowledge resources and refer to their quality,
- connected with further improvements and possible changes of our library according to postulates of their users.

2.1 The structure of a Virtual Library

Because of the future usage of our library in lifelong learning processes there was a postulate: it should be fully available for its registered users.

From the user’s point of view the Virtual Library with educational resources consists of general information part, "entrance" part, list of courses and indexes, courses with knowledge, questions and problems to be solved and tests.

In general information part one can find introduction describing the educational project and its product - the virtual library, its mission, general description of its contents and its place in the educational system.
An introduction on how-to use that library, registration module, catalogue of all courses and resources, general guidelines concerning the education process belong to the "entrance" part.

The detailed catalogues of problems and detailed subjects which one can learn i.e. the detailed catalogue of resources are included in the third part.

The presentations, texts of lectures and exercises belong to the part of courses. Each course begins with its description containing rationale, aims, objectives, predicted time of learning, list of needed hardware and software. The knowledge, which should be already known by learner, is indicated. There is also a list of courses, which are suggested to study before and after that course. Each course is split to knowledge units devoted to particular problems. Each unit consists of notes, presentation and description of exercises, which should be done. In the course there are: a list of questions verifying the acquired knowledge and/or multiple-choice tests. In the first stage we have mainly courses on the fundamentals of the information technology, operating systems and databases. There are also links to that documents, placed on the Nicholas Copernicus University Library and Information Science department server or in the Internet, which describe the similar problems or may be of the special interest for learners, some encyclopedias, and so on.

The last part contains various tests and pages with questions. One can proof his/her knowledge using them.

For the disposal of users there is also a search engine that allowed the finding particular document placed in the library. In the beginning its role is not so important but its meaning will increase with grow of number of courses.

In general our library consists of information resources and tools for its creation, managing and maintenance. Among the last mentioned are information server and browser, Web pages editors, software for registration module etc.

2.2 Tools for creation, managing and maintenance of virtual library

The library is placed on the Sun Ultra Station working under UNIX operating system. As the WWW server the Sun Web Server 1.0 is implemented. From the technical point of view library consists of documents saved in html, ppt, jpeg and gif files linked together. Each course is placed in separated catalog on the server. There is another catalogue with the image files containing elements linked to or included to more than one course document. There is also a separate catalogue for the "entrance" part documents.

There are tools and database for registration of users and their activity. All information, written there, are fully available for administrator. Each user has access only to its own data.

The tools for creation of WWW pages are placed on different computers including IBM compatible PCs with Microsoft software. One can mention various tools for creation of WWW pages. The Microsoft Word 2000 is very comfortable however it gives to long source code because of many unnecessary declarations. Therefore, some WWW documents should be simplified in their HTML code. From the creator of WWW pages point
Virtual Library as an educational tool for information specialists

of view the following tools are the most convenient Pajček (a Polish editor of HTML documents), ezHTML, Tiger, Macromedia Dreamweaver, Macromedia Flash etc. For creating the graphics Adobe Photoshop is mainly used and recommended.

The same hold for browsers. Various types of them can be used.

The administrator collects question from the users and manage the special list with FAQ (Frequently Asked Questions).

To the special duty of administrator belongs the indexing of the WWW pages with all courses and other resources of the library.

2.3 Selection of knowledge resources

In the process of education some didactic rules should be preserved. Therefore a standard for the WWW pages for our purposes has been established.

The quality of didactic resources depends on many factors, which should be taken into account. During creation of documents, which were included to the Virtual Library with educational resources, the special attention was paid to:

- their informative contents [7],
- the sequence of the didactic materials,
- their adaptation to learner’s knowledge and his/her abilities,
- the appropriate vocabulary, language and style of publication [7].

All above-mentioned factors result from well-known didactic principles and have the influence on intelligibility of material. The sequence of the didactic materials, which should be consistent with the principle of logical succession, has its projection in course structure. Its correctness could be examined by graph method or matrix method.

Each course consists of WWW pages. They could be organized in various structures: hierarchical, linear, linear with alternative links, mixed - a combination of linear and hierarchical or networked. From our experiences it is evident that the mixed structure is the most suitable and it is most frequently found in educational resources.

The other factors are connected with the appearance of the single document, with the arrangement of text, graphics, multimedia or interactive elements on it. The documents (WWW pages) should not be too long. They are sent through the network, which has restricted throughput and the channels have restricted capacity. That is why it is better to have a few pages of medium size than big one. The pages should not be overloaded with graphics. If it is possible the small pictures with a small number of colors should be used. However the value of illustration from the didactic point of view should be preserved.

Taking into account that some users will work with the only text browsers e.g. LYNX each presentation should have its text version.

In our Virtual Library there are links to other external sources, which are not placed on the library server. There were evaluated taking into account the bibliographic data, their accuracy, currency, usefulness and other features. The special attention was paid to:
3 The usage of the virtual library in education

The first documents, which were delivered to students of Library and Information Science at Nicholas Copernicus University in an electronic form at our virtual library, were summaries of lectures and questions for revision the knowledge from the subject Databases. After examination session the students were asked for their opinion about that documents. During the inquiry the course participants emphasized the advantages of that kind of presenting knowledge. They indicated that thanks to that documents:

- they exactly knew the range of obligatory educational material,
- they were informed precisely which knowledge they had to learn during lectures and which skills they had to train during practices,
- it was easier to prepare for the tests and examination,
- they knew exactly where to find the interesting for them documents, when they wanted to brush up the appropriate knowledge, they did not lose time in looking for information in the other sources,
- the time spent on preparation to the examination on that subject was shortened.

All mentioned above factors caused that the students were better prepared to the final examination and they feel sure about their knowledge. That is why they passed the examination with better marks.

Could handing the summaries of lectures, written in classical - printed form, to students have the similar effect? May be, but it should be stressed that in the users opinion the tremendous popularity of electronic documents came from new for them and very interesting form of presented materials as well as from short period of time spent on accessing the needed information.

It is obvious that presentation of that documents in classical - printed form certainly would not result in following indirect effects, observed by the lecturer and very important in education process:

- accessing the needed documents students gathered new experiences, they worked more often (frequently) with the computer acquiring proficiency in using the appropriate tools,
– the students became convinced that it was possible to find information on almost every subject (theme) in the Internet.

Moreover the students, asking the other lecturers about possibilities to find the similar documents from the other subjects, aroused teachers’ interest in that form of presenting materials. In that way they contributed in automation of process of disseminating knowledge.

On the next step presentations as well as texts of lectures and exercises were included to our virtual library.

On the Library and Information Science Postgraduate Studies there is no enough time for lectures. That is why the postgraduate students were suggested to gain knowledge from our virtual library. Most of them work in libraries, where they have access to the Internet. But even those students, which have not those possibilities, went to the computer laboratory or Internet clubs in order to complete their knowledge. It was checked how the usage of the library documents, which was very high, extended the possibilities of disseminating knowledge. Especially that part of Database course, which treated about library systems, was very necessary for those students. There are polish systems: MAK, MOL and SOWA, which are used in polish libraries. During lectures and laboratories there is time to present only one of them. Thanks to virtual library, students have the opportunity to learn about all of them.

The other experiment concerning the usage of materials spread through the Internet was done with second year students of the Library and Information Science at Nicholas Copernicus University. They were asked to acquaint themselves with the contents of indicated document, accessible in the World Wide Web system, and found there information referring to the specified topic (theme). After some time the level of acquiring knowledge by students was checked. It became evident that some of them have difficulties in learning. They did not know to which problems pay attention. They were not able to indicate most important information. They exposed very often the insignificant details. It was necessary for the teacher to indicate the most important problems discussed in that document. Then, after reading the document once again by the students and discussing its contents with the lecturer, the teaching aims were reached. So it is obvious that documents published in virtual library with educational resources, which are intended to be used in self-education and in distance education have to be provided with the methodical instructions concerning the process of learning.

The virtual library with educational resources should also contain the modules, which could be used for checking the level of acquiring knowledge by its’ users.

4 Conclusions

In information society the circumstances of acquiring knowledge are changing rapidly. Lifelong learning and self-education become necessity. The high hopes in all types of education are set with the usage of virtual libraries in education.

The project undertaken at Library and Information Science Department at Nicholas Copernicus University led to construction of virtual library with educational resources from the
field of information science. It contains not only documents created by our lecturers but also links to other sources, written in Polish language, available in the Internet. The documents were selected taking into account their informative contents as well as well known didactic rules, which should be preserved in the educational process.

The costs of virtual library consist of costs of maintenance the hardware and costs of working out the educational resources. It is easier to make changes in the documents delivered in an electronic form than in the printed version.

Library and Information Science students of Bachelor and Master degree and Postgraduate studies tested the usefulness of virtual library in education. The experiences were positive. The students of postgraduate studies have the opportunity to acquire more knowledge and to learn in their own rate.

References


On-line Learning for North-West of Russia

A. Lifshits and T. Gavrilova

Vocational Renewal Centre "Management and Computer Technologies",

1 Introduction

Development in information technology impacts all fields of educational research, from basic to applied. The described projects are based at interdisciplinary research on new Internet technologies which results may be implemented in a wide variety of practical distance learning courses.

Two distance learning (DL) courses "Up-to-date construction management" and "Business planning and investment analysis" were developed and successfully carried out by Vocational Renewal Centre "Management and Computer Technologies" in 1999-2001 within the projects partially supported by grants of Eurasia foundation (www.eurasia.msk.ru). The major part of students (150 in total) present St.-Petersburg, Petrozavodsk, Archangelsk, Pskov, Vologda, Obinsk, Murmansk and other small and middle enterprises and companies of North-West region of Russia. The interest to distance learning courses may be explained by the fact that many managers in CIS companies are rather skilled engineers or accountants but do not have enough knowledge in new forms of management, finances and law.

2 Trends

The simple overview show that there are two opposite approaches to the organisation of distance learning in WWW. The first of them uses on-line mode, the second one - off-line. In the first case only a standard WWW-browser is required, while in the second case auxiliary software is necessary on the client host. Both of the systems, however, function in the framework of the client-server technology and use CGI interface, which is common for most of such systems.

It is worth mention that difference in these approaches is well correlated with the complexity of the corresponding learning material. For now, it is very difficult and at least inefficient to simulate complex processes via standard HTML (even with Java applets), therefore the use of special client software is justified.

Currently, the following methods of distance learning in Internet are well studied and widely used in practice:

- WWW as a data source without any efforts to maintain a DL system;
- Server-hosted software development;
- Auxiliary client-hosted software development.
The most important directions of further development of Internet-based technologies which would help in maintaining DL systems, are (except Java or other script language applets):

- HTML extensions for CCI (Client Communication Interface);
- Synchronous conversation applications for WWW (analogs of Unix ‘talk’ or Windows ’chat’).
- Multimedia newsgroups.
- Virtual reality.

3 Methodology

This paper deals with our experience based on the results of the first project devoted to management in construction companies. The main project objectives were:

- to design the course’s structure and materials;
- to provide methodological, software and telecommunication implementation of learning material with the use of new technologies (WWW-server with lectures and tests for on-line work, CD-ROM for off-line study, teleconferences via INTERNET, feedback with tutors via e-mail, etc.);
- to develop special software tools for rapid prototyping of different DL courses and for maintenance of administration procedures.

The content of the course is equivalent to the 60 hours university course (authored by Prof. Kaplan and Dr. Maslova). Each student studied 70-80 paragraphs, passed through 8 tests, participated in 3 tele-conferences and took part in final test.

On-line learning procedure was the following (Fig.1):

1. the student gets information about the course on the Internet site or from the other place, he/she fills registration form and receives password and instructional material (CD-ROM);
2. then the student studies material and tests in individual pace, takes part in teleconferences under the tutor’s guidance;
3. when the student finishes the study he/she passes through the final quiz and gets the certificate.

4 Architecture

The described project is based mainly on WWW-platform. WWW unifies several existing Internet protocols (such as ftp, http, wais, etc.) and one new (html) around the concept of hypertext which becomes standard de facto in DL.

The developed system gives the student the following modes of study:

1. Plain distribution of volumes of learning material. These include both online tutorials in standard formats (html, rtf, etc.) and some special interactive courses, intended to be run as local applications;
2. Collaborative Learning in the network (via Internet-based teleconferences on special topics. Distant tutors work as moderators.);

3. Interactive online courses with immediate access via HTML browsers.

Implementation of B and C methods of DL requires special Internet programming tools which were developed.

Having analyzed some existing DL systems, which function in WWW, one may draw its typical structure. Usually the following active components which may be represented either by "real" human persons or special programs (here we enter the multi-agency) are found in such systems:

1. Tutor, which forms and presents learning material. It may be either a human being or a computer program (intelligent agent).
2. Supervisor, which watches and controls the learning process. Again, it may be either human person, or an special (agent) program.
3. Assistant, which tries to help student in various aspects of learning process. The fields of assistance may include domain knowledge, adaptation of interface, Internet usage, etc.

The other usual components of DL systems include

- Learning Material. It may be both hypertext and special training programs.
- External Data Sources. Everything not supported explicitly by the system, but required or recommended during education (hardcopy tutorials, video cassettes, etc.).
- Auxiliary Tools. This includes various computer techniques, which out of the scope of the system, but are required for it to function properly (such as communication programs).
– Administration subsystem.

Such typical structure may be implemented in different ways that is illustrated by many existing DL systems.

The special software tool “DOSTUP” that implemented main program functions was developed in new programming language PYTHON (with Tim Geleverya as main programmer) for rapid course development and project maintenance and support. Fig. 2 shows the functional structure and architecture of the developed system.

5 Discussion

The topics of distance education now are widely discussed among researchers, teachers, educationalists and authorities. In some countries DE becomes the item of the national strategy.
But DL-courses development is still more art than science. That is why practical results of any DL-course implementation should be thoroughly examined. The described course on construction management and software system are now on the Web (www.csa.ru/AI/bm) and are under updating and preparing for commercial distribution. The second project aimed at business planning and investment analysis is at development phase.

References


