Building Digital Audio Visual Collections for Research & Teaching: a collaborative approach.

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Abstract:
Since 1995 the La Trobe University Library has been building upon the infrastructure and experience provided by a National Priority (Reserve) Fund Grant for the Library Image Database Project. Quite independently Dr. Richard Cosgrove, La Trobe University Department of Archaeology, gained a 1996 C.A.U.T. grant to develop a text and CD-ROM for teaching skills in faunal analysis.

This paper discusses the intentions and outcomes of these projects and how advances have been achieved as a collaborative approach has developed into a working model for building multimedia Web resources for research and learning.

Background

The initiative began in 1994 with a funding submission to the National Priority Reserve fund. The early stages of the project were reported on at the 1996 VALA conference, "Networked multimedia – the AV Librarian's dream come true"[i] A detailed report is now available on this project on the Library Gateway site [ii]

In 1998 we also conducted a trial of a video on demand system, the report was published last year.[iii]

The Present

The Library Image database project was completed in 1997 when the funding was expended and the report was sent to DEETYA. With this money the Library had also established a digital resource capability. This Database has continued to grow by using the infrastructure established from the 1995 grant, with ongoing funding provided from the annual Audio Visual collection budget allocation. Currently the database contains 5 discrete collections, comprising some 2,500 images and related descriptive data.

1. Zoology _ Australia Papua New Guinea, Marsupials

2. Human Communication Sciences

3. Australian Zooarchaeology

4. Occupational Therapy

5. Medieval Music Database

The first two collections were established with the DEETYA project funding, the others were funded from the annual Audio Visual collection allocation.

The DEETYA project enabled the Library to build the technical infrastructure and to develop the expertise to enable us to select and cost the acquisition of the other collections. This was done at approximately $1.50 per image for capture while the submitter did the indexing. Library AudioVisual Services staff then mount the data on the Library Website and maintain the database. However, it has only been with the methodology developed with the Australian Zooarchaelology Collection that real progress has been made in creating systematic resources, which are now being used regularly in coursework and research. The remainder of this paper will explain why this is and how we plan to proceed to build on this experience for other disciplines and applications.

How Two Independent Projects Became One

Problems encountered with current Web delivery approaches

To date the common approach taken to internet access and Web resource delivery has largely focussed on transferring or reformatting print resources onto the Web, e.g. exam papers, timetables. These, although useful, do not take advantage of what are the new capabilities provided nor do they deal with the screen delivery / design issue during the transfer. Using the Web as a reference source of itself often leads to frustration and confusion on the part of students who cannot easily make the change to the Web, as opposed to a primary text placed on closed reserve. They may not have easy access to a PC; the site may be temporarily down or designed by another party for a completely different purpose.

Problems encountered with delivering multimedia content

To date, the advantages of multimedia capabilities have been restricted to the publishing medium of CD-ROM, which still has a fairly limited reach outside the Library. Therefore, our experience has largely been that any useful scholarly title, e.g. Perseus[iv], is both costly and difficult to provide access to. One copy in the library makes an interesting research tool, but hardly provides advances in access to primary sources for hundreds of students or an improved gateway to an understanding beyond a good textbook.

Problems with the use of the growing network infrastructure and capabilities

The Internet is chaos with little application or thought given to local, more focused & specific applications in teaching and library use. In fact, many sites are unreliable and difficult to cite reliably. For example, a teacher librarian at a Melbourne private secondary school assisted students who were researching a topic for religious studies. The topic was ‘women in the bible’; they searched on Adam and Eve. The search provided the students with details of a number of graphic porn sites.

Equally, although there are many examples of excellent multimedia applications which have been developed at individual Universities and by individual academics under the C.A.U.T. programme[v], there has very little co-ordination or thought given to the wider access issues after publication, enabling the investment made to benefit other Universities and disciplines.

This problem, of isolated resource developments by individuals and institutions, with no thought of an ongoing delivery and maintenance infrastructure has been very well documented by the CATRIONA 2 project in the U.K. [vi]

The report concludes with the following list of justifications for developing partnerships with academic libraries in these endeavours.

1. The provision of an access route from the Internet.
2. Integration of access to printed and electronic resources.
3. Integration of access between different organisations.
4. Provision of advice on standards and formats.
5. Provision of advice on some aspects of quality control.
6. Provision of advice on, and operation of, maintenance procedures.
7. Provision of advice on legal issues.
8. Provision of current awareness and bespoke identification of relevant external resources and developments.
9. Operation of cost recovery mechanisms.
10. Operation of authentication mechanisms.
11. General academic liaison on information needs.
12. Provision of neutral, objective focus and support.

Problem definition in Teaching

The use of Digital audiovisual collections in teaching via libraries has had limited application. Many university academics are familiar with off-the-shelf packages of electronic display like Microsoft PowerPoint but few go beyond the boundaries of this delivery device. This is partly the result of the nature of the disciplines themselves, partly the lack of imaginative application, partly the lack of expertise in a very complex area of multimedia development and the time and money involved to turn tired old lectures into lively and accessible presentations.

It becomes even more problematic when attempts are made to provide ongoing links between various web sites and sophisticated databases. Another problem, which crosses all areas, is the ubiquitous appearance of individual web pages offering, in many cases fairly superficial information about a range of offerings. These are not costly in themselves but the outcome is that limited resources are spread thinly among many departments. The other significant problem is the inappropriate use of data delivery via the computer screen. For example lecture notes are often placed on web sites. The

application of digital audiovisual to facilitate access to research data faces a similar dilemma.

Problems of project initiation

The teacher or researcher often identifies a need for course or data delivery electronically but their knowledge of how to achieve this is limited. More importantly, as previously noted, is the importance of identifying appropriate data sets or subject matter for electronic delivery. Simply loading print materials onto the web ignores the potential of digital audio-visual technologies. Equally, University AudioVisual departments may be unaware of the range of subject matter that could be appropriately converted into electronic media and delivered via the web. Quite clearly an integrated approach is needed where content, structure, production, access and delivery of such services is tightly co-ordinated between libraries, production houses both internal and external and university departments. This paper outlines the highly successful nature of such a collaborative approach.

Advantages of Digital Delivery from Library Systems

Archaeological Project Outline

The development and application of digital audiovisual technology to the collection, storage, retrieval and delivery of archaeological information has accelerated over the last few years[vii]. It has culminated in a growth of web sites across the world, which offer archaeological subject-based virtual libraries, text sources, forums for the exchange of ideas and links to museums, institutions, societies, famous sites and monuments. Even virtual sites can be constructed allowing the visitor to 'walk' or 'fly' through monuments, ancient buildings or ice age cave sites ([viiiix];). They provide very useful sources of information about the discipline but are often tailored to general needs of our Northern Hemisphere colleagues or static presentations of archaeological projects. More particularly these sites are often created without specific application to teaching or research. Indeed in many instances they are electronic creations of large projects structured initially for delivery using text. One example is the Lapita [x] project where archaeological excavation forms are simply reproduced on screen or lists of skeletal collections housed at different institutions [xi]. Others are essentially a way of advertising departmental research and teaching. This is not a bad thing in itself but they ultimately miss the vast possibilities and flexibility offered by digital audiovisual delivery in teaching and research. Other sites dealing with zooarchaeological internet resources were identified by Moore in a recent paper [xii].

It is true to say that the analysis of material remains surviving from the deep past is the archaeologist's primary source of data and its analysis is the primary source of information generated about the past. Further, the analysis of excavated archaeological remains lies at the heart of any undergraduate teaching and research program in archaeology. Access to primary data for teaching and research is problematic since text

based publishers are very reluctant to publish esoteric material that won't sell. In Australia we have also relied on American or European reference texts for teaching and research in two important areas; stone tool and animal bone studies (zooarchaeology). The significant problem has been that there are no texts or manuals that are suitable for teaching students about the types of archaeological remains regularly recovered from sites in Australia and New Guinea, and none that included step by step learning.

The zooarchaeological and stone artefact image database project was designed to fill this major gap in teaching students and researchers about the specific identification and analysis of archaeological materials, in particular faunal remains. Its focus was the development of an integrated three way approach to formal class instruction; a manual, a CD-ROM and the image database located on the La Trobe University Audio Visual web site.

The Project Aims

The aim of the project is to provide access to archaeological faunal and stone artefact data via the Audio Visual image database and provide animal and stone artefact recognition skills to undergraduates and researchers in the field and the laboratory. The approach aims to expose students to the variety of approaches to the study of faunal and stone artefact remains.

The three components to this strategy are

- The Digital Audio Visual Database, La Trobe University Library which contains over 580 skeletal images of 26 Australian and Northern Hemisphere mammal species
- A print instruction manual
- An interactive multimedia CD-ROM called 'Hands of Time'.

They provide a guide to the range of methodologies and practices employed to interrogate faunal and stone assemblages.

The Structure

The manual contains instructions of how to use the La Trobe University Audio Visual bone image database. A list of key words to search the image database, an introduction to the mammal skeleton, screen text of the CD-ROM, three tables which describe over 580 skeletal images of 26 Australian mammal species found commonly in archaeological sites and a selected Australian zooarchaeological bibliography are provided. The various Tables contain image descriptions of archaeological bone recovered from late Pleistocene limestone cave sites in Southwest Tasmania. The caves contain evidence of human occupation spanning the period 35,000 BP to 13,000 BP. Other Tables list skeletal elements of common mammals found in southeast Australian archaeological sites as well as lists sorted by species. The image database also contains x-ray images of aged macropods and details of teeth eruption from wallabies aged one year and older. The

catalogue is being added to continuously and will contain images of a range of Eurasian animals and extinct Australian fauna in the near future.

The Digital AudioVisual database provides students and researchers with a virtual bone and stone artefact laboratory reference collection. It means that a large number of animal species are immediately available for comparative purposes obviating the need for laboratory storage of extensive skeletal collections. It also protects valuable and unique collections of archaeological remains from constant handling and further deterioration particularly in classroom settings. It provides first order identification of mammal skeletal parts found in archaeological contexts.

It does not seek to replace the essential laboratory bone reference collections from which further, more detailed examination and comparisons can be carried out. The AudioVisual Database also contains digital video of actualistic experiments such as bone processing carried out by zooarchaeology students. They present the results of hard hammer percussion, stone tool and metal knife stripping of meat from bones. It demonstrates the pattern of green bone spiral breakage and marrow extraction.

The **"Hands of Time"** CD-ROM aims to introduce the methods and practice of zooarchaeology using examples from the Southern Forest Archaeological Project, Tasmania. The CD-ROM contains an interactive exploration of the Southern Forests Archaeological Project faunal analyses and is divided into six modules. These are (1) A short introduction to the research project; (2) the research methodology; (3) the site description, in this case Nunamira cave; (4) a bone reference collection; (5) a set of frequently asked archaeological questions about archaeological bones with strategies for their resolution; (6) an interactive scenario providing a set of increasingly complex student exercises on database manipulation; (7) a conclusion. For study purposes the screen text is produced in the manual to help in the navigation around the CD.

Technical development issues for ongoing collaboration and development

We have built upon the experience gained and the methodology developed during the Library Image Database project, but we have also been able to enhance and improve the process for a real application, developed by one of us (RC), while using the improved capabilities of the later Web browser versions.

Identification of relevant resources (teaching fauna & stone)

The first phase of the archaeological project was identifying the appropriate animal species and stone artefacts, which were to be used in teaching/research. The focus was on Australian and New Guinea archaeological sites, and a selection process was undertaken identifying species/stone artefacts commonly encountered in archaeological excavations and surveys. These items were systematically gathered from the Museum of Victoria, Mammal and Anthropology Section.

Digital camera technology was initially used for image capture but, after proving to be of limited quality, slide film was used to photograph each specimen. The objects were

photographed orientation, species/artefact name; museum catalogue number and a written description were recorded.

One photographer and one recorder were used throughout the entire process, which had significant outcomes. This ensured that the 1,800 slides were correctly labelled and described that the criteria of quality assurance and image standardisation were met

Copyright

On the advice of the University solicitor the initial project is limited to images owned by the University and which are, therefore, free to use. As we identify collections, which we wish to acquire in future, the University will seek to negotiate rights with the appropriate copyright holders. Alternatively, the proposed amendments to the copyright legislation may provide some form of fair dealing provision for the purposes of research, study, teaching and learning. However, until such time as there are clear guidelines for electronic copying the project must proceed within the guidelines, which are currently in place.

The other major copyright issue is the protection of the material that is made available over the Internet. This has been addressed in two ways. Firstly, it is clearly stated on our opening search screen that the material belongs to La Trobe University and can only be copied with permission. Secondly, we have instituted a mechanism on the server, which only allows users coming from a La Trobe network domain address to view the full screen image.

The image capture methodology

This too has adapted with both the technology and requirements. The primary approach, developed during the project, still applies. That is, capture the resource and generate three files, two for the Web database and one high-resolution file is archived to CD-ROM. If needed, another Web file can be generated, or alternative output produced, e.g. manuals etc. This facility has been extremely useful in developing the learning manuals and CD-ROM for the archaeological project. Having ready access to the high-resolution images eliminates unnecessary duplication and repetition at later phases in a project. The archived images can also be used in publication where high quality images are needed especially when colour formats are required.

The photography unit of the University was provided with $45,000 from the project's allocation for equipment. The equipment then provided a fast and flexible solution to 24-bit image captures from a range of source materials. We were also fortunate to be able to complement this equipment with related equipment, which the Photography Unit had already purchased with University funding. This included a dedicated slide scanner, a flat bed scanner and a dye sublimation colour printer.

File creation

The images are captured at the highest resolution screen display, (1024X768X32K). Three graphic files are created. One 12MB Targa and two JPEG files, one of up to 200 KB for full screen display, and one smaller 15 KB file for the thumbnail display. The Targa file is archived on CD-ROM and the JPEG files are transferred over the network to the library WWW server for use in the image database.

Database development

It was decided that the most expedient method was the use of PC technology. The descriptive catalogue records are created on Microsoft Access and exported, as tab delimited fields, into Microsoft Standard Query Language files on the Unix server.

Cataloguing/Indexing

The method used currently, developed during the L.I.D. project, uses the descriptive data provided by the submitting department. For example, it took a person some three weeks to catalogue 500 images onto an MS Access database template. This data is emailed to us, together with the relevant JPEG numbers for the two Web images. At any stage in the process, the data in the MS-access database can then be uploaded to the Library WWW server into the Standard Query Language Database.

We are in the process of investigating an improved process here which incorporates our new Integrated Library Management System, Innovative Systems, which has a Web based catalogue. This mechanism will involve some form of collection level description in the main catalogue with hyper links to the database. However, we plan to continue with the collaborative approach, we hope, by having the initial descriptive record created by the submitting department.

One of us (TC) has also looked at a number of software products, which will enable us to generate JPEG images at nominated time code intervals while capturing and encoding video data files. This would allow a form of automated direct ‘chapter’ access to sections of a video from the images placed within the catalogue record.

Search and Display options

The main screen provides four search options.

1. Keyword search across all fields.

2. Browse by Course Code Name, as provided in the course handbook.
3. Specific field search; displays all the fields in the record for user to choose from.
4. Select by image number

The results of a search, which results in six or less hits, will display the descriptive record together with the thumbnail JPEG image. The thumbnail images will hyper link to the full screen image. If more than six descriptive records are retrieved, a listing of titles and keywords is displayed, from which to make a selection.

Client access and rationalisation of data delivery on international basis

It is envisaged that the database will be continually updated with a range of information that will be of international interest. For example two collaborative projects out of La Trobe University, one with English Heritage & Cambridge University, the other with Birkbeck College, University of London will use the image database to record an array of important historical material culture and faunal images, normally inaccessible to students and researchers. At the global level the audioVisual database provides a comparative skeletal image database where animals of different species can be compared within a laboratory setting.

Evaluation & refinement of structure.

150 – 200 archaeological students are to test the strengths and weaknesses in design and delivery by evaluating the CD-ROM, image database and manual. The evaluation will provide information on technical, pedagogical and content areas of the teaching resources.

Advantages

The appeal of such a structure is that it encourages the students to carry out research in both text and electronic mediums. It allows the delivery of specific information gleaned from a vast database of over 500,000 entries on bone and stone artefacts. The great advantage is that both the visual and spreadsheet database can be searched for particular images or data sets of bones and stones. The use of SQL query language is flexible and applicable to many other databases. These images can be compared in this virtual laboratory just as one would used comparative collections in actual laboratory or field settings. The power of such delivery far surpasses the tedious comparisons that students or researchers have to make with two-dimensional line drawings or photographs. The manual manipulation of an integrated database of this size is impossible without such technical capabilities of the library web site and CD-ROM. The advantage of this integrated approach is that the information is intellectually and technically underwritten. It goes through a process of peer group review so that the origin and academic integrity of the data is known and secure. Such a database has also on-going infrastructure support and can continually be up graded, as needs change. Unlike the web sites of individuals or

departments, an institutionally designed and supported database has both longevity and sustainability. The fact that multimedia capabilities will increasingly become part of all electronic publishing and scholarly communication is becoming very evident.

"Words still have …primacy, but they can be illuminated by images and moving pictures and by numbers and sounds." [xiii]

The Future

Media streaming capabilities and Video Server Trial - 1998

The intention stated in the 1994 L.I.D.project application had been for,

> "The provision of a single interface for accessing and using digital media of all types - with greater network capacity and developing data standards other media types (such as sound files, full motion video files) may be included in the database and interactive capability enabled. This will compliment and extend the current developments in interactive multimedia application in learning at La Trobe University."

This is now technically possible and we have shown that this facility provides many major advantages over analogue video services. The trial of the video on demand system was arranged between Digital and the Library in May 1998. The trial had three primary aims:

1. The evaluation of the system, developed by Compaq, and comparison between this system and the existing Library analogue video system, which currently delivers multiple format video, within the Library, to 23 video carrels and seven viewing rooms.

2. An investigation of the potential enhancements and innovations that networked digital video may bring to the support of learning and research activities on the Bundoora campus.

3. A pilot to enable the Library to estimate the infrastructure investment requirements and service delivery issues associated with developing a staged development of ongoing video on demand services.

Video selection

The selection of video footage was informed by the experience we had gained with the Library Image Database project. That is, video material was identified and selected for adding to the server using the same basic criteria:

1. Copyright ownership - La Trobe University

2. A required video 'text' for course works in semester 2.

Within these basic guidelines the Occupational Therapy course supervisor did the selection.

Educational Outcomes: What we found

An evaluation was undertaken by Kim McShane, Lecturer in Flexible Teaching and Learning from the Academic Development Unit, which focussed on staff and student satisfaction levels with the service. The main focus group comprised 120-second year students from the 4-year Bachelor of Occupational Therapy degree course. The subject selected for the trial, by the subject supervisor Glenys French, was Occupational Therapy Intervention 2 (OTI 2).

The result of this particular survey was very supportive of the system. The 64 OTI 2 students valued the user friendliness of the server technology for its computer based access and they indicated that they were at ease in finding material and navigating the interface. This ease of use contrasts with the present arrangements whereby

1. the user/s must book both the analogue tapes and the viewing space in the library, and

2. Have the technical facility (and quick reflexes) to control a television and VCR effectively.

Staff opinion as expressed in the survey results supported this student held perception. Student and staff cohorts expressed the desirability of expanded access to the digital material, with both groups requesting access to the material in teaching areas or computer laboratories closer to the physical areas associated with teaching and learning.

Both staff and students made comments on the potential that this methodology could provide if expanded to external WWW delivery. The staff and some students mentioned possibilities for enhancing flexible learning on and off campus if access to the video material were to be made available on the WWW (digitised), as part of distance-based courses or in self-paced learning packages (analogue or digital material).

Conclusion

The creation and delivery of Digital AudioVisual collections for teaching and research has proved to be an exceptional resource, one which we are only now just beginning to exploit.

At its core is an infrastructure and technical capability that delivers successful outcomes for image-based teaching and research. When linked to specific course needs it provides students and researchers with a structure that allows it to be used as both a self-paced learning tool and research database. The ease with which the database can be both added to and interrogated from remote locations, using a standard SQL structure, provides many long-term advantages. The introduction and use of digital video will greatly enhance and expand these capabilities.

The ideal of any application of technology in teaching and research should be to assist and enhance scholarship.

"Indeed, the digital convergence of the traditional contact and the distance universities may mean that the very Fordist concept of the university 'classroom' itself may be abandoned as an obsolete mass-production device in favour of that classic educational ideal since the time of Plato's Academy: one-on-one tuition"[xiv]

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