HERDING TACIT KNOWLEDGE: THE OPPORTUNITY FOR REAL TEAMWORK IN DIGITISING INFORMATION RESOURCES IN SUPPORT OF LEARNING, TEACHING AND RESEARCH AT THE FACULTY OF VETERINARY SCIENCE, UNIVERSITY OF PRETORIA

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ABSTRACT: The paper will outline the factors leading to and including the establishing of a digitization project at the Faculty of Veterinary Science, University of Pretoria. The project is a shared endeavour of the Department of Telematic Learning and Education Innovation (TLEI), the Academic Information Service (AIS) and the Faculty of Veterinary Science.
The Faculty of Veterinary Science identified a need to preserve their slide collections and engaged in a project, subsidised by TLEI, to digitize their total collection of slides which amount to 40 000. Even though the slides were digitized, it was still impossible to search for specific content, because the content was not "tagged" (enriched with metadata) in a meaningful way and keywords could not be used to search and find specific images. The images were only available on CDs.
The Faculty houses rich and diverse heritage and learning resources which is mostly unavailable to researchers and learners. Since these are the only sources in South Africa that are also being widely
used in the rest of Africa, it is of the utmost importance to safeguard these sources and enhance their accessibility through innovative ways. The imminent retirement of elderly staff members may result in the permanent loss of tacit knowledge. Years of unpublished research work would be inaccessible to future users. This led to the second phase of the digitization project, namely enhancing the accessibility of the webready images, and the adding of metadata in collaboration with the lecturers and the AIS.
The paper will explain the aim of the project and the role played by the growing need for organizing and retrieving digital materials in support of learning, teaching and research. The project plan will include the development of metadata templates and standards; the collaboration and shared responsibility/management, the role of the AIS in applying of metadata, selecting a thesaurus, and designing the database and user interface. The future plans for optimizing the use and preservation of a digital archive for the Faculty will be discussed, including skills development training in the effective searching and application in WebCT.

Preface

Universities are constantly being subjected to renewal and new educational approaches in order to focus on education and innovation excellence as part of their core business. The University of Pretoria (UP) strives to be an internationally recognised South African teaching and research university and a member of the international community of scholarly institutions. In support of it's mission the university encourages academically rigorous and socially meaningful research, particularly in fields relevant to emerging economies.

The university is committed to effective, efficient, caring and innovative approaches to education excellence. The focus has shifted from teaching and the transfer of knowledge, to learning and the facilitation of learning processes, supported by appropriate educational ICT (Information and Communication Technology). Information technology is changing the access to knowledge, the process of learning, and the delivery of education and training and should be based on international best practice.

These changes are necessitated by:

- Technological and social changes
- New educational approaches
- Increase in the importance of open and flexible learning
- Digitisation of information and communication media
- Commercialisation and globalisation of higher education
- The pursuit of quality
- The increasing demand for access to information and
- Google's initiatives

The challenge of transformation from a traditional paper-based format to an electronically enhanced format has become imperative if any institution wants to stay abreast of global trends. Organisational survival is furthermore complicated by the demand on academic institutions to freely share their intellectual property for learning and research with other interested parties. As government funds are dwindling, universities are struggling to survive in an ever-changing environment and by embracing the e-challenge, could present

exciting opportunities for positioning themselves as world leaders.

The need to digitise

According to an OCLC (Online Computer Library Center) report article, March 2003, entitled "Five–year information format trends", electronic course management materials are one of the more exciting areas to watch in future. More e-content needs to be made available, consequently enhancing access to more college/university information. This will escalate the need for the digitisation of material also amongst scholars, and raises another important question: What about the tacit knowledge available in institutions? This knowledge is vulnerable and can be lost either through people leaving the institution or because such knowledge is not in the public domain. Part of the challenge of any digitisation project is to capture such specific tacit knowledge and convert it to implicit knowledge for long-term preservation and use throughout the institution.

The Faculty of Veterinary Science is the only veterinary school in South Africa and is in a fortunate position that it houses rich and diverse resources. It also has access to tacit knowledge through its highly qualified and well experienced staff. The problem, however, is that this information is in the lecturer's office and unavailable to other researchers and learners. Older staff are approaching retirement which places a greater importance on the capturing of their tacit knowledge before it is lost to the institution. The University, and the Faculty in particular, is moving towards technology enhanced learning where e-learning, problem-based learning and virtual learning environments are in great demand. Universities are also exploring alternative ways of generating income and the selling of digitised information is a way of narrowing the gap left by dwindling subsidies from government.

The Veterinary Library possesses the valuable collection of Sir Arnold Theiler, known as the Father of Veterinary Science in South Africa. The collection consists of photos, postcards and other memorabilia, preserved by his daughters. It was donated to the library after their death. This collection is now in the process of digitisation.

Solution to the problem

The establishment of a digital archive is seen as one way of solving the problem and would enable the Faculty to digitise and preserve the intellectual output of their lecturers, departments or laboratories and enhance the accessibility thereof. An important project of this nature will deliver on key areas such as -

- Access to valuable resources that are otherwise unavailable
- Enhancement of public knowledge through the recognition and understanding of collections of original works
- Creating resources that are suitable for use in learning and teaching which will support technology-enhanced learning initiatives and support life-long learning
- Generating income which can be ploughed back into other initiatives
- Capturing information about resources that will otherwise be lost for ever (tacit knowledge)
- Paving the way in the area of knowledge management systems in tertiary institutions
- Playing an important role in delivering information to the rest of Africa

Collaboration project between TLEI and the Faculty of Veterinary Science

The Faculty of Veterinary Science possesses an extensive slide collection of about 40 000 items. These slides were used, on a limited basis, in teaching and research within the Faculty. The slides were dispersed amongst different lecturers in different departments. In some cases the intellectual property and ownership were claimed by the lecturers of those departments themselves. The Faculty, through the subsidised services of TLEI (Telematic Learning and Education Innovation), began to scan the full collection of slides and to save it on CDs.

The initial idea of the project was to make the slide collections electronically available to the departments to enhance the access in teaching, training and research work. After the scanned images were given back to the departments they were, however, still not structured or "tagged" for easy access. It was up to the owner with knowledge of his collection, to retrieve the correct slide from the CD for a specific purpose. The stored information was not kept on a centralised server and the information was therefore not intact. The life span of information on a CD varies from two to ten years, after which it starts to fade. It could therefore be assumed that the information would still be lost for future research.

Veterinary science resources, unique to South Africa, and which can be widely used in the rest of Africa, may become obsolete to future users if metadata (electronic data about the data) is not added to make it accessible and retrievable. These resources are unique because of the scientific knowledge that was captured during the past years, for instance: indigenous diseases, parasites, pastures, etc. It is of the utmost importance to preserve the sources and enhance their accessibility through innovative ways to accelerate and enrich education and research.

Collaboration between TLEI and the AIS

During 2000 the Academic Information Service started to investigate the possibility of digitising its African Indigenous Heritage Collection. Training was done at the Digital Imaging of South Africa (DISA) (http://disa.nu.ac.za) during May 2004 and the know-how was brought back to the University of Pretoria, as

well as the magnitude of the inevitable costs for equipment for the realisation of such a project.

From the outset, the possibility existed that the project could expand to include collections outside the African Indigenous Heritage Collection – and that was, indeed, what happened. The establishment of any digitisation project should be well planned in advance as the cost implications are enormous.

The need of the Faculty of Veterinary Science for enhancing the access to digitised information was identified and TLEI joined the AIS in a collaborative project in May 2004 to assist the Faculty in storing and retrieving the knowledge on their CDs in a more structured manner. Certain key issues were first considered before developing a digital archive for the Faculty:

- Institutional culture: the trust and collaboration that existed in the Faculty
- The reason for an archive for the Faculty
- Selection criteria for deposits into the archive
- Different access levels
- Legal requirements with regards to copyright issues
- Standards for interoperability
- To be successful, time and energy must be committed to the project
- The long-term commitment to ensure the sustainability of the archive
- Funding

The abovementioned issues are crucial in determining if all the role players share a common vision and understanding of the purpose and scope of such a digital archive, and that these elements are addressed in the project plan.

Personnel from the following support services form the digitising unit and are responsible for the workflow and administrative matters regarding the project. The Faculty is involved and participate in the project on a limited time basis:

(a) AIS - responsible for categorising, digitising and setting standards
(b) ICT - looking at system compatibility with ICT strategy
(c) TLEI - use of digitised content in WebCT courses
(d) The Faculty - owner of the knowledge content

The appointed project members hold regular meetings to determine progress, sort out problems and compile reports. The on-going maintenance and preservation of resources are the core business of this digitising unit.

Workflow
Method of digitisation
Educated and informed decisions about the digitisation processes (selection criteria, scanning, metadata inscription, archiving, etc.) have to be made to avoid duplication or any mishap which could delay the project and make it more costly.

The following considerations have to be taken into account:

- The most minute significant detail has to be identified; for instance, colours in photographs may help scholarly interpretation. With the latter in mind the AIS team has decided to scan all the archival (the original scanned) material by default at 24 bit standard colour at a minimum of 600 dpi (dots per inch) and these master images are stored in *.tiff format
- In the case of the Veterinary Science project the scanning had already been done by TLEI according to international standards and made available in *.jpeg format
- Although in jpeg-format, the team, however, decided to continue with the scanned slides and use them to avoid duplication of the work done by TLEI. The original images are saved on hard drives and back-ups are available on DVDs at the Faculty
- The webready images were derivated to 700 x 422 ppi (pixels per inch). The user can view the image in this format, but when the print option is chosen, the image will print as a thumbnail. This is an additional safety measure to protect the slides. Thumbnails of 120 x 72 ppi were made from the original TLEI scanned images. A thumbnail of the original is of no value unless the user gets access to the original JPEG format of the image on the server
- Quality control on the scanned, as well as the derivative images will be done in all cases.

Adding of metadata
As part of the investigation into the retrieval of digitised text, it was decided on Dublin Core as the metadata standard for the University of Pretoria for the description of simple textual or image resources. The basic fifteen Dublin Core elements were customised for application in the Veterinary Science environment. Qualifiers have been developed to make the meaning of an element more specific and to identify schemas that help in the interpretation of an element value. The TEI (Text Encoding Initiative) and EAD (Encoded Archival Description) are the preferred choice for text markup and archival/manuscript material. As the project team wants to assist lecturers to create unqualified Dublin Core metadata for their slides, the team developed an easy to use metadata template on the UPPortal (http://infoportal.up.ac.za). Lecturers wanting to participate and write metadata for their slides can register as members of the metadata micro database and submit their information to the digitisation team by completing the template.

After the template is submitted, the metadata librarian adds value to the metadata, e.g. definitions, controlled subject headings and appropriate URL (Uniform Resource Locator) links. This will ensure a product of high quality and enhance retrieval. Before web publishing, the metadata librarian will do the necessary

quality assurance tests. The quality control is imperative and must be done by trained personnel.

Some lecturers prefer to submit the unqualified metadata in paper format rather than through the UPPortal. In case of paper based information, the open source software, Note Tab Light Editor, is preferred by the library as the software for the creation of metadata in XML format by the metadata librarian.

The user interface

To convert the metadata retrieved from the UPPortal in XML (eXtensible Mark-up Language), the metadata is downloaded as text and then converted with a program "Marcedit" to XML. A style sheet (XSL (eXtensible Style Sheet Language)) is created to interpret the source code of the XML file, which then in turn is parsed through a style sheet transformation file XSLT (eXtensible Style Sheet Language Transformation) for presentation on the web (*.html). The importance of converting metadata information into XML via XSLT is that with XML you can create your own mark-up languages so that the same content can be provided in a variety of formats. XML is a meta-language which describes web data and its structure, while HTML (HyperText Markup Language) describes how data should be presented on the World Wide Web.

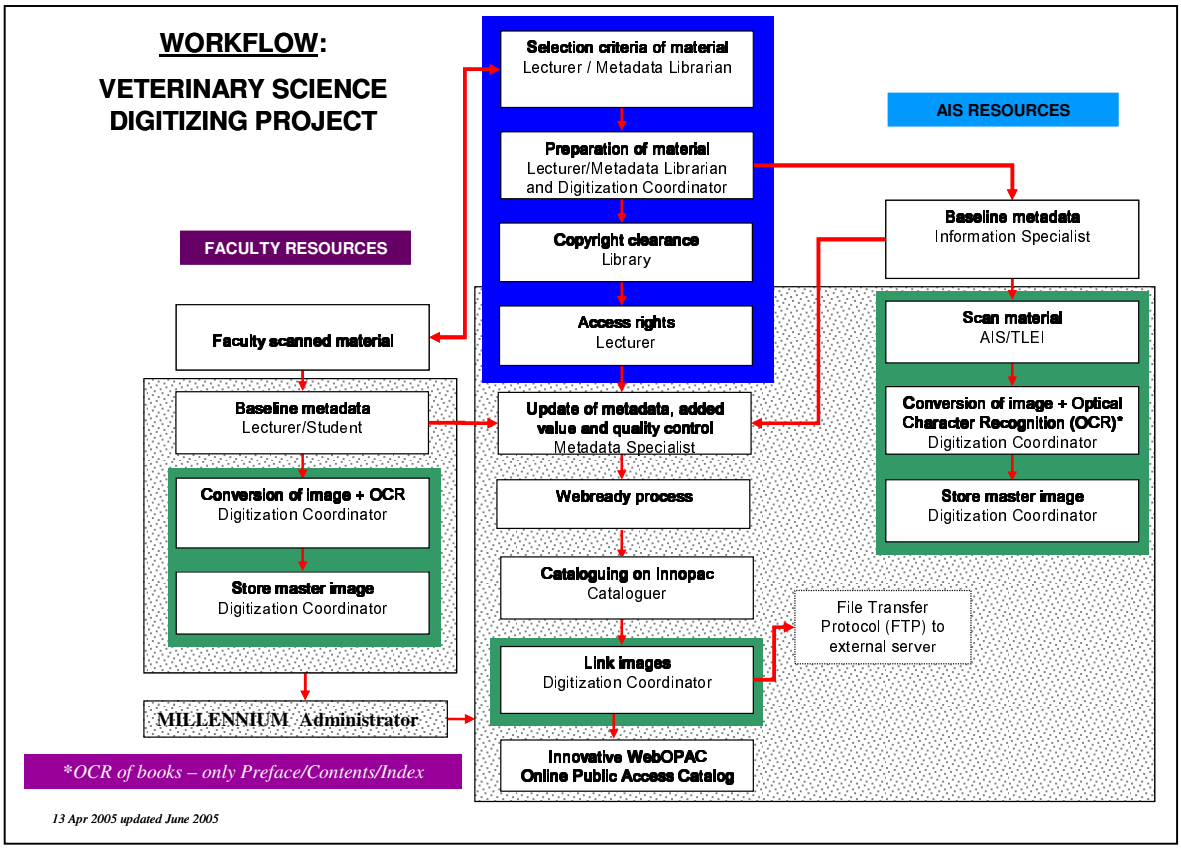
The XML file and the images are transferred to an external server. A bibliographic record is created on MILLENNIUM (Innovative Interfaces Inc. Automated Library System), the automated library system. The URL of the HTML record is linked to the bibliographic record in the MARC (Machine-readable Cataloguing Record) 856 field on MILLENNIUM ensuring access to the records. The content and image of a document are kept separate and can be stored on one central server. This will avoid the duplication of data.

To safeguard the intellectual property rights of the lecturers, authentication for retrieval formed an important part of the initial plan. Although the thumbnail images and bibliographic data will be accessible and searchable on the library's catalogue, the content owner assigns levels of access to the potential user.

The advantages of MILLENNIUM WebOPAC (Online Public Access Catalog) as user interface and gateway to the WEB are:

- Familiar to students and lecturers
- Excellent full-search capabilities
- Thesaurus already available LCSH (Library of Congress Subject Headings)
- External linking possible
- Access control manageable
- Z39.50 broadcast searching
- Easy access, cross-reference and/or retrieval for WebCT courses, teaching and research.

A Schematic representation of the workflow



Herding the tacit knowledge: Step one

With a project of this magnitude, it was necessary to integrate the needs and requirements of all the stakeholders to ensure the support and sustainability of the project. Clear communication measures needed to be put into place to gather and collate all needs from all parties and to report on progress. Our approach was to persuade lecturers with a positive attitude to the e-environment to "share" their slides with others and submit the metadata to the cataloguer, who in turn added value. Initially we worked with two lecturers/researchers to recruit content for the archive and thereafter networked to other colleagues.

With the existence of the meta-information, objects can be discovered through the World Wide Web and help users to evaluate a resource, make a judgment about a resource, compare it to other resources or assess its usability.

Herding the tacit knowledge: Step two

The first occasion to introduce the lecturers and researchers to the process was the Faculty's Open Day in September 2004.

Posters were made which described the complete process and were supported by a continuously running Power Point Presentation. Staff of the Veterinary Science Library approached individual Faculty members and negotiated with them regarding the project. Members of the Faculty responded positively and the project was kick-started.

The Faculty personnel had to be persuaded that, although adding metadata to their resources was time consuming and difficult, it would enhance the value of their product and the outcome would be an accurate retrieval of the slide. Furthermore the investment in the initial digitisation project by TLEI would not be justified without their involvement in the metadata. It would further provide access to information for learning and research and preserve valuable “grey” resources for UP and the Faculty.

Herding the tacit knowledge: Step three

A survey questionnaire (Appendix A) on the need for a UP Digital Repository was distributed among the lecturing personnel of the Faculty.

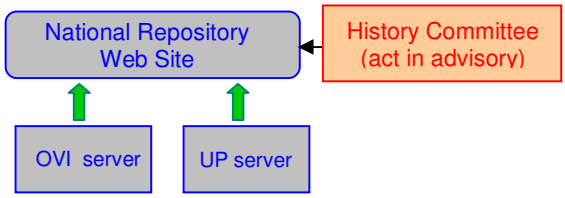
Interpretation of the survey results

- 26 questionnaires were sent out
- 15 lecturers from 6 different departments responded
- 9 respondents indicated that they had information they would like to put into such a repository
- Slides, articles, lectures and case studies were the main types of information identified for the repository
- Limited access to colleagues and students, was the preferred choice
- Purpose of the repository was identified as:
  - Preservation for future research
  - Selling to generate money
  - Problem-based learning
- All the respondents were willing to submit baseline metadata
- The questionnaire enabled us to identify additional metadata/search points specifically for the Faculty, for example Disease, Age and Breed.

The future: National repository for veterinary science

As an extension of the digitising efforts, a collaborative project ensued between the Faculty of Veterinary Science of the UP and the OVI (Onderstepoort Veterinary Institute). This project will aim to digitise historic and other material of interest to the veterinary science fraternity, belonging to both UP and OVI. The information will be made available for research and education within and beyond South Africa, through a National Repository for Veterinary Science. This repository will be managed and maintained by the project committee. The History Committee of the South African Veterinary Association will act in an advisory capacity and will be kept informed by the project committee.

The envisaged repository will be constituted as follows:



Each institution will retain ownership and copyright of their content but will make it searchable and accessible through the National repository. Accessibility will be ensured through the digitisation according to standards, as determined by the project committee, and funded by sponsors obtained through the joint project proposal. The searchability will be ensured by the metadata attached to the digitised objects according to the predetermined templates. The experts who are part of the project committee will ensure the quality assurance of both processes, while postgraduate student assistants will do the basic digitisation and metadata addition.]]

Duplication will be avoided, digitisation techniques standardised and institutions will retain their own copyrights. Duplication of archives between the Faculty and OVI will be encouraged for security reasons.

It is anticipated that within the next ten years the National Veterinary Science archive will grow to provide access to enriched data collections and to digitised research in Africa.Collaboration between institutions will be enhanced and the exchange of **web**

based learning objects will broaden opportunities for students and researchers.

TLEI is currently upgrading its learning management system (WebCT Vista) and this will further optimize the use of content from the digital archive for use in some of the e-learning modules and possibly also in computer-based testing. Lecturers will also be able to utilise the digital content in the delivery of their lectures. The digital archive will underpin the vision and mission of the University of Pretoria as it strives to be a leader in higher education that is recognized internationally for academic excellence and a focus on quality.

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APPENDIX A –

UP Digital Repository Survey

Dear Staff member

- Please take 10 minutes of your valuable time to complete this survey.
- We need your feedback in order to make informed decisions about the UP Digital Repository Project.
- Please contact Amelia Breytenbach (Amelia.Breytenbach@up.ac.za or 529-8391) if you want to see a demonstration of such a repository/digital archive first

1. To which Department do you belong
   ……
   ……

2. Are you lecturing
   1. Full time?
   2. Part time?

A digital institutional repository is a "store-room" that captures, stores, indexes and preserves the intellectual output of a university's research in digital format. The aim of such a digital archive is to manage these knowledge objects in a professional way to make them more visible and accessible over time and to preserve tacit knowledge for further learning, teaching and research. Examples of such knowledge/information objects are slides, presentations, articles, "grey" literature, newspaper clippings, reports, etc.

3. Do you have any information that you would like to put into such a repository, for example slides, articles, etc.?
   1. Yes?
   2. No?

4. How should the access to the information that you would like to add to the institutional repository, be governed?

   1. Open access to everyone?
   2. Limited access to certain groups?
   3. Access for myself only

5. If you choose limited access in the previous question, who would you allow to access the information? Examples: colleagues, students, external users, etc
   ……
   ……

6. For what purpose do you think can the information in the repository be used? Examples: problem-based learning, selling of the information to generate money, preservation for future research, etc.
   ……
   ……
   ……
   ……

Metadata allows for standardised, precise description of resources. The advantages of attaching metadata to your information resources are:

-Storage on a server and not a "fade-away" CD
-Accurate and easier retrieval of a slide, etc
-Security can be attached
-The information is available for future presentations, articles, etc.
-Training/educational opportunities
-Preservation of valuable "grey" resources for UP and the Faculty of Veterinary Science
-Contribution to a digital archive for the Faculty of Veterinary Science
-Support problem based learning as well as e-learning

7.	As the owner of the information are you willing to submit baseline metadata for the repository/digital archive? Baseline metadata will be title, creator/copyright owner and 2 subject terms describing the information resource. 1.YES 2. NO
8.	What metadata/search points would you like to add to the baseline metadata (mentioned above) to increase searchability? …… …… ……

THANK YOU FOR YOUR VALUABLE TIME!