



JISC Final Report

Versatile Digitisation Framework (VERDI), University of Kent

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Executive Summary

The main aims of the VERDI project were to create functionality which could be used to allow holders of digital images across the University to catalogue and store the material in line with current standards and to allow the material to be easily accessed via the Web. The idea was to extend the architecture developed under the JISC-funded British Cartoon Archive Digitisation project (BCAD) by making the architecture more generic and then to demonstrate the applicability of the framework in a range of scenarios. The BCAD architecture is comprised of a propriety database used to catalogue the material and open source programs to make the material available on the internet. It was believed that any database could be used for the cataloguing and then the architecture of open source programs could be used to make the material accessible. The expectation, which has been realized by the VERDI project, was that an adopter of the resulting framework would be able to use it to digitise, catalogue and present the digital resources to JISC standards via a searchable web-based interface that can be embedded into existing special collections and departmental or project websites.

Three unique and important collections were selected from different departments at the University of Kent to provide the scenarios:

Sporting cartoons by Tom Webster (1886-1962)

http://www.cartoons.ac.uk/search/cartoon_item/artist=webster

The British Cartoon Archive (BCA) holds 3735 of Webster's original Daily Mail drawings along with 404 unique cartoons in annuals which form a major resource for the study and understanding of British sports history in the inter-war period, from 1919 to 1939. Sports history is a growing research interest among UK academics, and will continue to expand as the 2012 Olympics approach. This material needed to be catalogued and digitised and then integrated with the existing digital images from the BCA website.

Renfrew Orkney Islands archaeological excavations

<http://www.kent.ac.uk/secl/researchcentres/histarchaeology/Resources/Renfrew/>

In the 1970s Professor Lord Colin Renfrew performed early excavations of the Orkney Islands and photographed his work. The photographs are held by the University of Kent's Centre for the History of Archaeology. The Centre is interested in understanding how archaeology developed historically, directing knowledge through the creation of tools and procedures and formulating questions, theories and agendas and these photographs are an invaluable tool in this research area. The photographs were already digitised and metadata was record in an Access database but the images were not being securely stored nor were they easily accessible. The material needed to be transferred into the VERDI framework and then code snippets were incorporated into the Centre's website which allow the material to be searched.

Muggeridge collection of windmills and watermills

<http://www.kent.ac.uk/library/special-collections/mills/search.html>

The University of Kent's Special Collections holds a unique collection of mill photographs dating from the early part of the 20th century onwards. It is particularly rich in black & white photographs of windmills & watermills, and other aspects of rural life, from a time just prior to the enormous changes which took place in agriculture and its associated technology during the latter part of the century. Cataloguing and digitising the material needed to be brought up to current standards, imported into the framework and the code snippets enabling searching needed incorporated into the collections website. Also, since the material lends itself to geographic positioning, a proof-of-concept page utilizing GIS information was developed.

Through the extensions of the existing architecture not only have the exemplar collections been successfully made available but additional material held by Special Collections, which was already catalogued and often digitised, was also incorporated into the generic framework. The next steps are to see how the generic presentation of the data is used, to receive feedback and to look at how the framework can be rolled out to other departments in the University.

Background

In common with many other universities, the University of Kent has an extensive range of specialised material contained within its Special Collections and embedded within its research centres and projects. The University has limited resources available for the preservation, processing and dissemination of this material and the available resources are used to support the most important collections which are managed to high professional standards. Thus a significant amount of material is therefore in storage awaiting processing and still more is held by research groups and individual research staff. Although some of this material is indexed and available for inspection, much is currently hidden from the wider academic community even within the institution. It is believed that the experience at Kent reflects a similar experience across the entire sector and that significant research and teaching resources are not being exploited as a result.

Through the recent JISC-funded British Cartoon Archive Digitisation project (BCAD) it was seen that the creation of a robust and flexible system can significantly widen access to unique and important material, in this case a collection of socio-political cartoons. The focus that the BCAD project put on digital collections revealed a host of existing digital material at the University that was either hidden, not being adequately preserved, or did not adhere to recognised standards and was thus difficult to search, present and share. The discovery of this already digitised material was in addition to all the material which could be digitised if the departments or individuals knew what to do with it once they had digital files.

The BCAD project developed an architecture which is underpinned by open standards and by well-established and widely used applications employed across many archives, libraries and digital collections. It was believed that if the architecture was extended, its standards-based approach would ensure that digital material could be more easily produced, adhering to standards and best practices, and could more straightforwardly be made available in a user-focused manner, thus offering a high-quality user experience which is sustainable.

Aims and Objectives

The general aims of this project were the following and did not change:

- 1) to extend the BCAD architecture, to make it more generic and useable by multiple collections
- 2) to demonstrate the applicability of the framework in a range of scenarios

Central to this project was the development of a flexible technical framework created by generalising the infrastructure and standards used for the BCAD project in order to make them suitable for any digital collection. The goal was to enable an adopter of the resulting framework to be able to use it to digitise, catalogue and present the digital resources to JISC standards via a searchable web-based interface that can be embedded into existing special collections and departmental or project websites. Specific objectives, which remained constant throughout the project, included:

- 1) the modification of the BCAD architecture so that it could accept and store material from other digital collections in an organised manner
- 2) the creation of search functionality based on the BCAD searching to enable the searching of one or more specified collections
- 3) the definition and standardization of a default set of fields (based on ISAD(G) and mapped to Dublin Core) which will be searched and displayed
- 4) the creation of a snippet/module for the University's website which could be embedded in web pages enabling the searching of one or more specified collections
- 5) documentation and dissemination of the project and framework to academics at the University as well as to the wider community

In order to demonstrate the applicability of the framework in a range of scenarios, and to address key objectives in the JISC's Digital Strategy covering accessibility, support of learning and teaching, inspiring new approaches and allowing difficult to fund work to take place (JISC Digitisation strategy

2008, point 5), the framework was used within the project to digitise and unlock three collections and embed these within Kent's website.

Sporting cartoons by Tom Webster (1886-1962)

The British Cartoon Archive (BCA) holds 3735 of Webster's original *Daily Mail* drawings and 404 additional cartoons in annuals. The drawings and cartoons were impossible to study since students and researchers could not be given direct access to the fragile originals. Digitisation and detailed cataloguing provided the only possible method of accessing the whole collection.

The Webster collection is the first non-political UK cartoon collection to be digitised and catalogued by the BCA. It is expected to inspire new avenues of research and teaching as well as to open new areas of exhibition and display for the BCA and different possibilities for using BCA online materials in teaching. It will also significantly add to the volume of research and teaching materials available on UK sports history, adding to the critical mass of available data within this area, and extending the type of material available. Other academic disciplines for which this material is relevant include Kent's specialisation in social psychology with support for themes such as humour and attraction.

This small-scale pilot digitisation and cataloguing mini-project was expected to demonstrate how the framework could be used to digitise, catalogue and deliver previously un-digitised resources and enhance an existing collection, supporting JISC's strategic imperatives: 14a – pilot and small-scale digitisation, making the hidden visible, addressing a recognised gap, mapping to a particular area of the curriculum or research interest and inspiring new avenues of research.

The objectives were:

- 3) to catalogue the Webster collection
- 4) to digitise the Webster collection
- 5) to provide access to the digitised items from the BCA website www.cartoons.ac.uk

Renfrew Orkney Islands excavation

History of archaeology is an emerging field which aims to understand how archaeology developed historically, directing knowledge through the creation of tools and procedures and formulating questions, theories and agendas. The study of the history of archaeology allows us to understand how the discipline contributes to knowledge about history, cultures, civilizations and, indeed, empowers us to use archaeology more effectively in the future.

The bequest of the archives of two leading archaeologists – Professor Lord Colin Renfrew and Professor Anthony Snodgrass - and the support of a number of other eminent archaeologists from around the world has created a unique teaching and research resource that will contribute to the development of the history of archaeology as a discipline.

As they become accessible, these collections are being used within Kent's Centre for the History of Archaeology as a resource to promote research and teaching in the area, with specific support of projects related to the collections and in the field of the history of archaeology. To date, the processing of these collections has provided limited access, consisting mainly of un-catalogued digitised photographs.

By enabling staff within the Centre to apply the framework to a collection of photographs of the Renfrew Orkney Island Excavations, currently partially available through basic HTML pages with limited metadata, the project demonstrated how the framework could be used to make accessible collections where there is a lack of professional archival support and limited technical expertise, supporting JISC's strategic imperatives: 14b – enhancement of existing collections, addressing a recognised gap within teaching and research provision, mapping to a particular area of research interest and inspiring new avenues of research.

The objectives were:

- 6) to transfer and supplement, as required, the catalogue information to a suitable database accessible within the framework
- 7) to transfer the digital images to the framework

- 8) to provide access to the digitised items from the within the website of Kent's Centre for the History of Archaeology at <http://www.kent.ac.uk/secl/researchcentres/histarchaeology/Resources/Renfrew/>

Muggeridge collection of windmills and watermills

The University of Kent holds a unique collection of mill photographs dating from the early part of the 20th century onwards. Initial work had already taken place on the digitisation and cataloguing of the most fragile material and digitised photographs were available on a web site, although not searchable. The framework which had previously only interfaced with Calm was extended to interface with MODES (a cataloguing system used widely within museums and used by some archives) and metadata was mapped to Dublin Core standards. A handful of records were given GIS coordinates and a proof-of-concept page was created that uses GIS coordinates to place mill locations on a map enabling future GIS-related functionality to be developed.

By allowing an existing unique special collection of mill photographs, currently available on basic web pages, to be fully digitised, catalogued and made searchable, the project demonstrated how the framework could be used to enhance an existing collection and interface to alternative cataloguing software, in support of JISC's strategic imperatives: 14a – pilot and small-scale digitisation, addressing a gap in research provision, contributing to creating critical mass within a given area and preserving material which is in danger of deterioration.

The objectives were:

- 9) updating of metadata to ISAD(G) standards
- 10) digitising of items not already digitised to current standards
- 11) development of a proof of concept page utilizing GIS information
- 12) creation of a searchable interface to the collection from within the new Special Collections website <http://www.kent.ac.uk/library/special-collections/mills/search.html>

Embedding the framework and exemplar collections at Kent

It was deemed important that the future support of the resulting framework and the exemplar collections be addressed and it was felt that this would be achieved at Kent through the adoption of the framework within the main Special Collections section and the integration of the exemplar collections. To achieve this goal the University funded the redevelopment of the Special Collections website which was run as a separate internal project. As was hoped, the VERDI framework proved sufficiently generic and flexible so that Modes data related to collections other than Muggeridge was easily ingested and made available.

Methodology

The project was essentially divided into four independent strands;

Three strands related to cataloguing and archiving:

- Webster Collection
- Muggeridge Collection
- Renfrew Orkney Island Photographs

One strand related to technical development

- generalization of the BCAD architecture

While each strand benefitted from sharing knowledge and lessons learned, there was very little overlap in functionality and resources. Therefore, each strand was allowed to run independently – reporting to the Project Manager and reviewed by the Steering Group.

There were no significant dependencies within each work stream except that the Muggerridge collection needed to be digitised before it could be catalogued since the negatives are too small to catalogue without a print or digital image.

The original BCAD framework was built on two widely used products: CALM (a well established commercial cataloguing system), FEDORA/SOLR (an open source digital object repository and indexing engine). These products are widely used across the sector and have formed the basis of other JISC-funded work. CALM is affordably licensed and this project will extend the framework to link to a second widely used cataloguing system (MODES) which will be used with the Windmills collection (see below). Interoperability, such as between MODES/Calm and Fedora was based on generic XML standards and formats.

Prior work on the BCAD project suggested that the use of SOLR and FEDORA in tandem were an excellent fit for the storage, retrieval and searching of a collection consisting of loosely defined metadata records. It was believed that the advantage of this open source approach over a more structured SQL-type solution is the ability to adapt easily to the potentially very different requirements presented by current and future data sets.

Given this experience we surmised that expanding our use of these two technologies to encompass multiple collections would be a sensible direction to take with VERDI and initially the extensions to the technical architecture developed in the BCAD project were expected to be achieved through minor modifications such as modularisation, increased parameterisation of scripts and limiting the default set of fields searchable to basic ISAD(G)/Dublin Core fields. However, the complexity of the BCA schema and presentation meant that updating the BCA code to use the modified framework was too cumbersome a task and instead the architecture was copied and enhanced. The result is that the VERDI architecture can support almost any collection and allow digitisation outputs to be made easily and efficiently accessible and searchable on the web. However, since the objective of the Webster Collection was to present it within the existing BCA website, it was decided to use the existing BCAD systems for the Webster material rather than the modified VERDI framework.

The architecture also uses PHP as the programming language and the Zend Framework as the development platform. The University's major web systems and publishing platform are built using these two technologies and by utilising them both within VERDI and BCAD, integration with the central University web setup was straightforward. In addition, given pre-existing in-house expertise, choosing PHP and the Zend Framework had the additional benefit of ensuring the technical sustainability of VERDI.

Scope and boundaries of the work, including any issues that will not be covered.

Cataloguing will, at a minimum, include the required ISAD(G) metadata but each collection may include additional metadata as we feel it is necessary to accurately describe the material. The new modules will search and display the minimum required ISAD(G) fields.

Items which are already digitised (e.g. the Renfrew Orkney Island photos and some of the Muggerridge Collection) will not be re-digitised even if the digital images are not up to current standards. The best quality image will be considered to be the archival surrogate and treated accordingly.

When digitising, the original digital archival surrogate is assumed to be an image of sufficient quality that significant post-processing will not be required.

Finally standards such as accessibility and HTML will apply to all new functionality/pages but legacy pages in which search functionality may be embedded may not be upgraded to adhere to the standards.

Implementation

The work which was planned and implemented was based on standard project management practices involving the creation and assignment of tasks which were regularly monitored through meetings to

discuss progress and highlight issues. Each collection holder (BCA, Special Collections and the Centre for the History of Archaeology) were responsible for managing and monitoring the work on their collections on a data-to-day basis. At the beginning of the project existing standards and practices were discussed and appropriately upgraded to ensure they met the expectations and standards committed to under this project while, at the same time, were suitable for the collection and consistent with the other material held by the department.

Cataloguing

The holders of the Webster Collection and the Muggeridge Collection already had well defined schemas in place so all that was required was a quick review.

The Centre for the History of Archaeology already had catalogued each image from the Renfrew Collection but it had been done from a practical perspective, not a standards-based one. The Renfrew collection was given additional assistance and time with an archivist to identify a suitable schema for the metadata and to understand how best to migrate existing data into the new schema. For the most part the new schema required information which was "self-evident" to be specifically entered and preserved with the image but did not require any additional research or knowledge. For example, the original cataloguing did not list "location" or date since it was known that the set images were taken in 1973 and were of the Orkney Islands.

The requirement of the project was to provide the required ISAD(g) fields which were then mapped to Dublin Core. However, the individual requirements of each collection meant that additional metadata was catalogued. The web delivery mechanism allows searching across all the metadata catalogued and displays all the metadata available.

Cataloguing was done on whatever system was deemed suitable; the Webster and Renfrew collections were catalogued in Calm, the Muggeridge Collection in Modes. Exports of the material held in Calm are automated so changes to the metadata will automatically be reflected on the Web within a week. Due to software limitations, changes in metadata in the Muggeridge Collection will only be available after a simple manual export is performed while the processing/ingestion of the metadata exports and images is automatic; triggered when the images/data are put in a defined location.

Digitising

The material in the Webster Collection is similar to material digitised under the BCAD project and thus the same standards, procedures and equipment were used. Digitisation was done in-house by an experienced operator.

The Muggeridge Collection is comprised of slides and negatives and the University Photographer oversaw the work and performed QA based on a well-developed procedure. An Epson 4990 was used to scan the colour slides and glass-plate negatives. A Nikon 9000 was used to scan the black and white film negatives. The colour slides, being more robust than the other material was scanned 8 at a time in an appropriate handling tray and QA procedures covered scanning quality as well as integrity of numbering and orientation. The glass negatives and white film negatives, which were more difficult to handle because of their fragile nature, were scanned singly to ensure the best quality result. The original raw TIFF images were saved and then a reusable JPEG image was created which was then sized appropriately for web use. The Renfrew photographs were already digitised and it was not part of the project to re-digitise them. However, the best quality images needed to be identified, checked and appropriately saved.

Technical development

A number of technical challenges were uncovered which had to be dealt with:

- Persistent identifiers - In order to ensure the integrity of data within the VERDI system it was decided that each record in a collection must have a field which uniquely identifies it within that collection. This proved to be problematic for collections held in our Calm archiving tool.

The tool itself provided no reliable unique identifier. We were forced to adopt two different techniques when dealing with these collections. The first option was to delete all trace of said collection from the VERDI platform before performing an update. Secondly, and preferably, we would work with the collection owner to elect a field within the collection to act as the record identifier. We would then rely on the collection owner to ensure the integrity of this field.

- Dates - Whilst many technical standards exist around the formatting of dates these seem not to have propagated as far as the world of archiving tools. In order to support the display and searching of dates within VERDI we have had to develop a fairly complex set of date processing rules but the acceptable formats of dates is still limited. For example dates such as "circa 1965" are common and allowed in cataloguing systems as are "approx 1965". While both VERDI and BCAD can accept the former, the latter is identified as an exception when ingesting the metadata.
- Character encoding - All of the collections included within the requirements were able to provide their data as xml. They were not however able to provide consistency of character encoding. We therefore had to develop an encoding normaliser as part of the VERDI import processes.

Outputs and Results

The project has made available over 10,500 images and related metadata along with the ability to view the images with zoom technology accessible from the University's websites.

- 3735 images of the original artwork plus 404 of annual pages of sporting cartoons by Tom Webster. A selection of personalities have mini-biographies to help situate them in history. These 4139 images are available via http://www.cartoons.ac.uk/search/cartoon_item/artist=Webster
- 1000 images of the 1970s excavations of the Orkney Islands performed by Professor Lord Colin Renfrew. <http://www.kent.ac.uk/secl/researchcentres/histarchaeology/Resources/Renfrew/>
- 6271 images from the Mugeridge Collection of wind and watermills at: <http://www.kent.ac.uk/library/special-collections/mills/search.html>

In addition, the framework proved sufficiently generic that all the existing collections held in Modes could be easily made available and viewable on the University website. This means that in excess of 26,000 records of the University's holdings are now searchable, some with images: <http://www.kent.ac.uk/library/special-collections/>

The Webster images are available through the existing BCA website and search engine. The Renfrew, Mugeridge and other Special Collections data is available via a simple search which can be embedded in any University webpage through code snippets in the standard Kent style. Submitting a search term produces a set of thumbnails of records with metadata containing the search terms. Note that it is not necessary for the metadata to have associated images which means that collections catalogued but not yet digitised are also accessible. Clicking on a thumbnail produces a page which shows:

- a medium resolution image with the main metadata (date, title, author) displayed and the full metadata record available on a tab on the webpage.
- a link to view the image with zoom technology
- thumbnail results (if any) of any images "below" the viewed item thus allowing the user to browse through an archival hierarchy.

The framework is documented and will be supplemented with the development of digitisation and cataloguing guides to be used by those adopting the framework. It is powered by two automated systems: One which takes large raw and adjusted image files, moves them to an appropriate location in line with the University's digital preservation policy, and creates images for web viewing (thumbnails, medium resolution images and tiles for zoom technology); And one which takes XML exports of catalogue records and indexes them for web use along with archiving the XML files.

Parameterized code snippets were created which can be included in University web pages producing style-able search results. While much of this code is specific to the overall systems architecture at Kent, we are happy to share it upon request.

Outcomes

The framework has created a facility to allow departments and/or individuals to upload their digital collections with minimal system configuration and training. This will allow people who already have digital collections to easily make them web accessible and searchable. It will also encourage individuals to use better standards making future interoperability easier and thus more possible. It will also enable academics to apply for funding where the digitisation is not a major part of the project and thus cannot justify large allocation of the proposed funding to produce the digital resource.

Not only has the framework allowed new material to be easily made available, but it has also encouraged the creation of a federated search of material from these digital collections. There is one search facility on the University website enabling users to search all the collections in the framework, thus allowing people to see, access and be aware of digital items across the University from one place. This should make it easier for people to find resources including unusual and unexpected resources.

It is also possible to create search pages which are limited to specific collections. For example, while the Renfrew Collection can be searched via the main library search page, the Centre for the History of Archaeology has a search incorporated on its web pages which only searches the Renfrew Collection. This ensures that people interested in specific topics can easily find and search those resources without being overwhelmed with other material.

The increased accessibility of the material should encourage more extensive use and re-use of images in teaching, research and study as well as set a good precedent for the dynamic use of collections endowed to Kent. People will be more encouraged to give Kent research material if they can see how it can quickly and flexibly be made available.

The standards-based approach is setting a benchmark for other collections. By implementing best practices, providing documentation and experience, and technical support, other projects or collections will be encouraged to raise their standards. In addition the knowledge gained by staff throughout the project relating to digitisation and metadata standards can be applied to other collections and shared with colleagues inside and outside of the University.

Team members have been exposed to the experience of JISC projects which is useful in many ways. Not only are they now familiar with best practices on running projects but they also have exposure to the bidding processes and have benefitted from the workshops and training offered by JISC. JISC projects are formally run to high standards which might frighten those not familiar with project management. They also often involve some technical work and many academics may not know how to start building a team. Demonstrating how departments can work together on future educational-related projects should encourage ideas and collaborations for which funding can be obtained.

Conclusions

The VERDI project has demonstrated that catalogued digital material can easily be made searchable and incorporated into the University's website. It has also demonstrated that providing a standards-based cataloguing platform raises the standard of the cataloguing and makes the data not only more interoperable but broadens the searching and browsing options, thereby making it more accessible.

By focussing on subjects such as archaeology, cartoons and wind and watermills which are both of academic value and of wider interest to society as a whole, the project has also aligned itself to ongoing policies within HE of community engagement and knowledge exchange. At the educational level it makes freely available potential teaching resources in the subject areas covered.

From a preservation perspective the VERDI framework encourages best practices and adherence to standards. Collections deposited may be static or updated regularly. The digital images and exported metadata which will appear on the web are held in a central location and replicated and backed up according to University policy but content owners have control over the images. This might be something that will be re-evaluated as the framework is rolled out.

While the VERDI framework also makes it easy to search and display the digital material, by definition it needs to ignore the complexities and intricacies of the data and related schema. Thus while material can be made accessible and searchable, it is possible, if not probable, that important and complex collections may benefit from bespoke development work beyond the VERDI functionality in order to bring the most out of their collections. For example, VERDI assumes the images are not restricted to specific audiences, it does not allow specific and bespoke relationships between items in the framework nor does it customise the labelling of metadata beyond the required ISAD(g) fields (the labelling of fields in the XML file is dictated by the original cataloguing software labelling).

Finally, the availability of a framework does not ensure the availability of storage space nor resources to digitise and catalogue the material. While the University can certainly offer some resources a large take-up of the framework would require funding from somewhere.

Implications

The next steps for VERDI would involve:

- Incorporation of Web 2.0 functionality. One issue with trying to incorporate user input into the metadata is that it is difficult to update the catalogue records in propriety systems such as Modes and Calm.
- Dissemination and encouragement of use of the material in teaching and research. Due to the timescales of the project, there has not been enough time to investigate ways to share and use the data but plans are underway to highlight the resources and framework in academic updates as well as induction sessions.
- Administrative functionality to manage VERDI. The framework and configuration files have no administrative front end. Therefore anyone who wishes to use the framework must receive technical assistance to set up a collection in VERDI.

References

VERDI project site: <http://www.kent.ac.uk/is/projects/bcad/>

Departments and Centres involved:

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University of Kent Special Collections: <http://www.kent.ac.uk/library/special-collections/>

Centre for the History of Archaeology <http://www.kent.ac.uk/secl/researchcentres/histarchaeology/>

British Cartoon Archive Website: <http://www.cartoons.ac.uk/>

Other related organisations:

BCAD project site: <http://www.kent.ac.uk/is/projects/bcad/>

Fedora Commons <http://www.fedora-commons.org/>

Drupal content management platform <http://drupal.org/>

Calm archive system <http://www.axiell.co.uk/382>

Modes collection management system: <http://www.modes.org.uk/>

Zend Framework <http://framework.zend.com/>

PHP <http://www.php.net/>

Solr <http://lucene.apache.org/solr>

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