# Title Work Package 4: Compendium of Use cases for a small selection of current students in FE and HE institutions

| | |
|---|---|
| Project Ref | *JISC 07/04 Distributed eLearning Programme* |
| WP Ref | WP 4 |

## Technical Interoperability

The technical elements of the project were designed to look at how the contents of an ePortfolio record could follow a student as they progressed through their academic career and beyond. This involved moving student data from an ePortfolio system at their previous college or university into their new ePortfolio at their future institution. For example, student may go from school to college to university and then into postgraduate education or work. Their portfolio record from each previous stage is very likely to be useful within each future stage.

The Faculty of Medical Sciences Computer Services at the University of Newcastle developed the ePET ePortfolio system.[1] Originally developed as part of a collaborative FDTL-4 project[i], the portfolio become synonymous with 'ePET' after the JISC funded ePortfolio Extension Toolkit (ePET) project which followed on from this. The original ePET project created an additional component that allowed ePortfolio data to be extracted from the ePortfolio in XML in a variety of interoperability schemas. A modified version of this was used in the EPICS project.

The ePET portfolio system is component based and easily customisable. It is structured in such a way that institutions can easily create and adapt tools to meet their own pedagogical requirements. It is built using open source technologies, principally Zope and MySQL. ePET is in used in a number of institutions, including Newcastle University[6], and was trialled at Teesside University throughout the duration of EPICS.

Blackboard is the market leading Virtual Learning Environment (VLE), used internationally by a wide range of customers, including some of the EPICS partners. To meet growing demand for portfolio systems, they have produced an unstructured tool that allows students to develop a web-based portfolio. The ePortfolio system is an add-on to the main VLE, and unlike the structured design of ePET, it is more of a file repository and a way of creating personal webpages. The City of Sunderland College has purchased this module, and has been using it successfully for a number of months.

The unstructured nature of the Blackboard ePortfolios means that they are able to blend format, resources and text very effectively. For example, within Blackboard, it is possible to have a page with text referring to the images displayed adjacent to it, all formatted according to the user's wishes. This requires very little know-how, as the What-You-See-Is-What-You-Get (WYSIWYG) editor is fairly straightforward to use. However, because of the unstructured nature, these associations are not defined in the HTML source code, and as such will not be seen to exist by a machine reading the source code; and this poses significant issues for transferring portfolio data between Blackboard and other systems.

## Interoperability Case Studies

The technical interoperability study involved transferring real and mock student data between ePortfolio systems, replicating the progression pathways that real students might take, while testing the options and possible solutions to the transfer of data between systems. A series of Case Studies were put forward following discussions with representatives of the partner organisations. This was documented in a series of case studies, and the actual tests involved transferring data from:

ePET ←→ ePET (Newcastle and Teesside)

ePET ←→ Blackboard (Newcastle and CoSC)

### *Case Study 1*

*A Full-time CoSC student, 16-18 year old, studying AS levels in Biology, Chemistry and Maths, who has also studied French, General Studies, Citizenship and Keyskills. They intend to go on to the University of Newcastle upon Tyne to study Medicine. Data would be transferred from Blackboard to ePET.*

Two real-life CoSC students were asked to allow the transfer of their data, and although they did not fit exactly into the student model suggested when determining this Case Study, they provided invaluable real life data, thereby helping to bring into focus the relevance of data transfers, and as such of the EPICS project as a whole.

The system at CoSC had only recently been implemented, and as such the portfolios were quite new and undeveloped, meaning that they lacked the diversity of content that could be expected from a mature portfolio. In particular they lacked examples of multimedia, with the only examples of binary data stored in their portfolios being a JPEG photograph and a CV in Microsoft Word format.

The CoSC portfolios were downloaded from Blackboard using the standard download tool. This allows the web pages forming the portfolio, along with any supplementary files to be downloaded into a zip file. The original data is safely archived in this zip file for future use, and allows the student to browse their portfolio locally as static HTML. This zip archive was uploaded into ePET using the date transfer module that allows zip files to be imported into the system. It reads any folder structure within the zip file and recreates that in the ePET file repository, storing the files in the corresponding folder. The contrasting nature of the structured ePET portfolio, and unstructured Blackboard portfolio meant that the design of the pages was lost in the transfer, although the original pages were kept in the archive.

During the zip file upload process, ePET reads through the uploaded archive attempting to locate any XML file. If an XML file is found it checks to see if it will verify against IMS-LIP[ii], and if so will parse that data inserting records based on the XML into the database structure. As Blackboard creates HTML and not XML, any text data stored within the HTML files in the zip archive could not be transferred into the relevant text boxes of the ePET portfolio. Some initial ground work was conducted to investigate how to achieve this and it was determined that for numerous reasons this was unlikely to be successful. The Blackboard WYSIWYG HTML editor allows so much flexibility that it was very difficult to program a system to take into account all the various possible permutations. This was exacerbated because the templates in use by CoSC did not produce valid

XHTML, meaning that standard HTML parsing libraries available to ePET could not read the Blackboard HTML in the way expected.

To transfer text data into the relevant ePET fields a 'cut and paste' technique was actually the most straightforward method, even though this was effectively a manual transfer. The student uploaded their zip file, and then went through the rest of their portfolio copying from their Blackboard portfolio and pasting into the most relevant area of their ePET portfolio. Although not automated, it was noted that this form of transfer empowers the user, in that he or she is in control of the data and its processing, which bypasses some of the more difficult legal issues around data ownership and data protection.

***Case Study 2***

*A Part-time mature CoSC student on a vocational course studying Music is interested in taking the Popular and Contemporary Music BMus Hons (W301) course at the University of Newcastle upon Tyne. Data would be transferred from Blackboard to ePET.*

The unstructured nature of the Blackboard ePortfolios means that they are able to blend very effectively format, resources and text. As a music student, this was very important as their portfolio was multimedia-rich, containing sample music files and potentially videos of their performances.

A fictitious student record was created within Blackboard. For expediency, it was decided to use a sample portfolio exported from ePET which was imported into Blackboard, modified to add multimedia, and subsequently re-exported, and uploaded into ePET. This actually replicated closely the sort of information that we would expect such a student to have recorded, although it also meant that the exported web pages were XHTML compliant, and mapped very closely to the IMS-LIP XML standard used by ePET for data importing and exporting. These web pages remained virtually unchanged during the importing and exporting process.

As the web pages were produced in a standard format, it was possible to map the data structure of these pages to the data structure of ePET. During the process of converting the XML downloaded from ePET to HTML,  tags were used to surround the required content, and these were given class attributes relating to the relevant tags within the IMS-LIP schema. Some work was undertaken to map these attributes to the ePET database, and on uploading the zip file, ePET could take a large proportion of the information within the HTML files and place them into the relevant area in its database.

The file transfer was quite quick, given the size of files being transferred. However, this could become a huge barrier if an institution has a slow bandwidth, because there is a possibility that the file could grow to a size that would time-out during a standard HTTP transfer, especially if the student has graduated from a four-year, multimedia-intensive course.

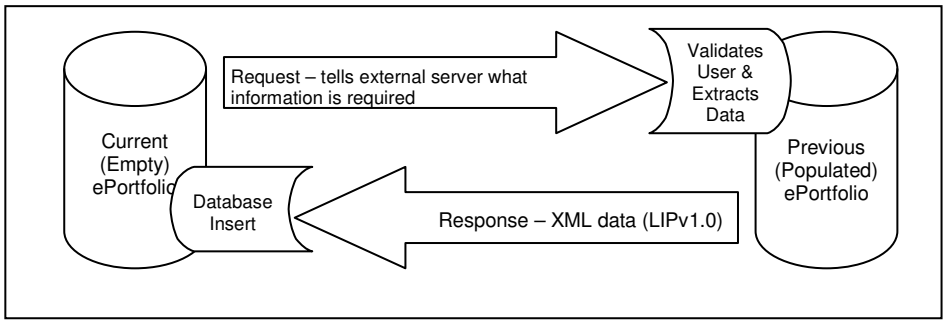
This process could only work as well as it did because the original source of data was a structured one, ie ePET. If the data had been extracted initially from an unstructured source (ie Blackboard) it would have been much more difficult to extract the data, as was shown in Case Study 1, which required the student to copy and paste from one portfolio into the other.

***Case Study 3***

*A University of Teesside Student, studying Midwifery, wishes to go onto the University of Newcastle to complete the MBBS. Data is transferred from ePET to ePET.*

The University of Teesside have been piloting a number of ePortfolio systems as part of the EPICS Project, including ePET and Pebblepad. Although no midwifery students are involved in the pilot, it is very likely that the School of Health and Social Care would actively take on board one of these ePortfolio systems. Medical students studying on the MBBS Course at Newcastle have access to an ePET portfolio through their Learning Support Environment (LSE).

A student record was created within Teesside's portfolio system that was designed to simulate what information a real student might store against their record. This information included CV-based data, a SWOT analysis and a number of Microsoft Word documents. The 'XML Transfer' option of their Newcastle Portfolio allowed them to move this data from their Teesside portfolio. Teesside University was selected from a list of institutions and to request that information they simply entered their username and password from Teesside. An XML-RPC request was sent from Newcastle to the Teesside server, where the request (including username and password) was verified. The contents of the Teesside portfolio were transferred into IMS-LIP v1.0 XML, and were transferred back to the Newcastle server, which read through this XML document and wrote the data found into the database.




This was a very quick process, and the majority of information recorded in their Teesside portfolio was passed between the two servers in less than a second. This would make life very simple for the student, and it may even be possible to transfer this data using a batch process before the student even joins their new college or university. A request could be sent listing all the users required, and the returned data could update multiple user records.

The main barrier to this kind of transfer is that it requires an agreement between the institutions involved to ensure that the data being moved is validated. It is hoped that the advances in Shibboleth could validate this process, but this is unlikely to remove the core debates between institutions regarding ownership and data protection.[iii]

A small amount of data was not transferred. Some was as a result of data not being mapped to the IMS-LIP schema. We found that many parts of the ePortfolio, mainly assessment related data, could not adequately be mapped to IMS-LIP. This issue was increased because in turn, a number of the key elements used by IMS-LIP could not be mapped to ePET in any way that would have been meaningful to external systems. The information that was not transferred included the SWOT analyses, action plan records, reflections against learning outcomes and comments made about the content of the portfolio. These items were all very much related to the Teesside course and how the student had performed while studying at Teesside. In many ways this information was no longer useful, and may even have been considered 'baggage'. In the case of reflections made against learning outcomes, it may even have had a negative effect on the new portfolio to transfer this information. The learning outcomes on the two courses are very unlikely to be the

same and, without changes being made to the ePET database, recording reflections against these would cause conflict with any future claims, and would have produced nonsense records.

There was one additional reason why some information was not transferred, and this was because the Teesside server used a previous version of the data transfer software to the Newcastle version. Although this proved to be backwards-compatible, in that data mapped to Teesside was transferred, it meant that some key portfolio data did not move between servers. The most important of this information being the files the student had stored.

It was felt that the biggest point to note from the work involved in creating this case study was that although some information must stay within a student's portfolio as they progress through their educational life, a large proportion of portfolio information has a definite 'shelf-life', and is not necessary after a certain point. However, this raises the question as to who decides which elements are important and which are not?

It was agreed that the most important information to keep within a portfolio are the documents created outside of the portfolio itself. Examples of this include Word documents containing essays and assignments, multimedia information created during the course and scanned copies of artwork. In many ways these are the items that would form a traditional 'artist'-type portfolio. Generally, students will want to take with them anything that will help them in their new course or career. Reflections against learning outcomes, SWOT analyses, and meeting records recorded electronically as part of an institutional or course-specific portfolio are unlikely to be relevant to any new courses the student will be studying. Often students see moving to a new course or institution as a 'fresh start', and may not want data relating to previous assessments storing within their new portfolio.

One possible solution would be for ePortfolio providers to move towards using external web services to provide some of the data within ePortfolios. For example, a blog tool could use the blogger.com API to allow students to record this information. It would then be accessible via their portfolio and by logging in to blogger.com. When the student changes institution, they simply tell their new portfolio to use their existing blogger.com profile. The number of students joining academic institutions who currently have a web presence through a blog or social networking service is increasing annually, and by utilising these tools it is ensures that students are familiar with the service on offer and are more like to engage with this.

By using external tools to host personal information, the academic institutions only need to be concerned with the development and hosting of course-related or academic elements of the portfolio. As these are unlikely to be required by the student as they move on, this would effectively remove any data protection issues, and would mean that in most cases the student would have full control over the personal elements of the portfolio, even when their employer or academic institution did not provide them with a portfolio. The exception to this would be where the home institution or a third party asserts ownership. An example would be evidence of a project created during an industrial placement. This is a governance issue, and the onus is on the data owner to provide details of what information they do not wish the student to share with additional third parties.

***Case Study 4***

*University of Newcastle student studying Dentistry wishes to go on to study a Taught D Prof in advancing clinical practice at the University of Teesside. Data would be transferred from ePet to ePet.*

A student record was created within the Newcastle University ePET system replicating the kind of information a real student might record in their portfolio. Information recorded included CV data, a SWOT analysis, web links and some Microsoft Word documents.

The student chose to download this information from their portfolio into a zip archive. Students can download their portfolios as zip files at any time by navigating to the 'XML Transfer' part of the portfolio and clicking on the link to download their file store. The zip file this creates contains all files stored in the portfolio and a valid IMS-LIP XML document, which stores the text data from their ePortfolio in a format recognisable to other portfolio systems.

This zip file could have been stored on CD-ROM, DVD, or even a USB Flash drive until a time when the student needed the information. By compressing the data within a Zip archive, the download time was reduced and the space required to store this information was greatly reduced. The actual zip file used in this transfer was little over 1MB in size and as such downloaded in a matter of seconds. There may be an issue with download times when using larger archives, especially if the bandwidth being used is not particularly high. The student may be required to download the portfolio in sections, or the institution may have to provide the downloaded portfolio for the student.

It was felt that if the university provided the portfolio, and did so using reusable media, such as a Flash Drive, there could be a relatively inexpensive marketing opportunity. The drive could be branded with the college or university logo and after graduation the student is very likely to reuse that media in future education or work. The costs associated with such devices has been decreasing over the last few years and given the economies of scale associated with the number of drives a college or university would require, the cost per student could be as little as £10.

By navigating to the same page in their Teesside portfolio from which they downloaded their Newcastle portfolio, the student was given the option to upload their portfolio in zip or XML format. The XML option allows text data to be transferred using IMS-LIP. If a student uploads a zip file, the system automatically looks through the files stored within it and if it finds any XML documents that validate against the IMS-LIP schema, will upload them to the database. On this occasion the student simply uploaded the zip file created when downloading their Newcastle portfolio. The IMS-LIP document allowed their portfolio data to be transferred, and the system read through the documents stored in the archive, transferring them into the student's Teesside portfolio.

This demonstrated quite nicely an alternative method of transferring the data from institution to institution. The alternative, using a HTTP (XML-RPC) transfer requires an agreement between the institutions involved to ensure that the data being moved is validated. This alternative system ensures that the student takes responsibility for the information, selecting for themselves what gets uploaded and what gets downloaded.

Some data was not transferred, and again this was the information that could not easily be mapped to the IMS-LIP schema. There is no obvious place to store information such as SWOT analyses, without causing compatibility issues with other portfolio systems. It is possible that IMS-

LIP is not the most appropriate XML schema to use when transferring portfolio data and the ePET development team are currently investigating the other options available, such as UK-LEAP[iv] and IMS-ePortfolio[v].

The question as to what information should and should not follow a student as they progress through their academic life was raised during this case study. It may be that the designers of IMS-LIP have developed the schema with this in mind, as it does seem to fit quite nicely with the information that the student is most likely to need to transfer. However, institutions need to agree what information they choose to allow students to transfer and what information they choose to keep. There are many factors in making this decision, mainly related to ownership of that information and data protection legislation.

***Case Study 5***

*A Full-time overseas student studying the MBBS course at the University of Newcastle by day is also undertaking a part-time course at City of Sunderland College to gain a European Computer Driving Licence on an evening. Data would be transferred from ePET to Blackboard.*

As in Case Study 4, the student exported data from ePET as a zip file containing all their uploaded resources and an IMS-LIP XML data file, essentially producing a self contained record of the data to be transferred. Unfortunately Blackboard is not readily able to import XML data into a meaningful and easily displayable/editable format, which meant that the IMS-LIP data contained within the ePET export could not be uploaded. The solutions put forward to solve this issue were a manual 'cut and paste' and the use of XSL transforms to change the IMS-LIP XML document into XHTML that could be uploaded into Blackboard as web pages. Although such transforms do not currently exist within Blackboard, this was deemed the most appropriate option, and appropriate transforms were created by EPICS project officers to facilitate this Case Study.

To transform data using XSL, two approaches can be taken, either the original XML data is kept, and is viewed using the XSL to format the page in a more 'friendly' manner, or the data is permanently converted to XHMTL replacing the XML tags with XHTML formatting tags. The first approach is the most pure, in that all the data is kept untouched. This means that the data is kept in a usable XML format. However, it is also very difficult to edit as an XML editor package is needed, and various skill levels are required from the user depending on the quality of the XML editor used. The alternative generates XHTML pages, which if properly crafted can keep most of the information held in the IMS-LIP XML data, but which users would find easier to edit than raw XML code. Blackboard uses a WYSIWYG HTML editor, which cannot read XML but could be used to edit the uploaded XHTML document. The main issue with permanent changes is that some data loss can ensue, as it is difficult to convert all the information held in the raw data format into something that is visually appealing once displayed. Although both conversion options had benefits, it was decided to use the transforms to permanently convert the data to XHTML pages prior to import, largely because of the compatibility issues that this might have with Blackboard's WYSIWYG editor.

Separate XSL transforms were created for each of the key 'top-level' elements of the IMS-LIP schema, such as 'identification', 'affiliation', 'goal' and 'activity'. A DOS batch file was created that ran the series of transforms against the IMS-LIP document, creating a series of web pages that could then be uploaded into Blackboard. The XHTML used was carefully created to ensure that the data remained within meaningful tags, using  elements for layout, with id attributes mapping exactly to the corresponding tag from IMS-LIP.

By maintaining these attributes, the XHTML could be transformed back into an IMS-LIP XML format, and used for data exchange once again. This was tested by exporting a record from ePET in IMS-LIP XML format, transformed into XHTML by the XSL transforms, imported into Blackboard and incorporated into an ePortfolio, and subsequently exported and imported back into ePET. Although this is still in the developmental stage, the results were promising, and the HTML parsing libraries available to ePET could readily parse the XHTML generated by the XSL transforms with no data losses.

A clean portfolio was created within Blackboard, and the Web Folder facility was used to upload the new web pages and additional resources into the Content System. A new folder was created into which all the relevant files were copied into this folder, including the newly created web pages, the supplementary data stored in the zip archive, and the original IMS LIP XML data which could be used to archive the old portfolio. Once the files were successfully uploaded, they needed to be incorporated into a Blackboard portfolio. Each imported page had to be individually linked using the 'add content' facility to ensure that they were accessible from a link in the navigation frame of the created Blackboard portfolio. A link was added to the newly created folder, setting the permissions for the contents of that folder, making the uploaded portfolio visible to third parties with whom the portfolio was shared.

A key benefit of the XSL transforms was that data from additional ePortfolio systems could be uploaded into Blackboard using the same scripts. It was hypothesised that any portfolio system that allowed an export in IMS-LIP XML format could use these XSL transforms to create data accessible to Blackboard. This was tested and found to be successful with data exported from several systems, with the only errors being raised by data exports that mapped their data to UK-LEAP rather than IMS-LIP. This would be a relatively straightforward addition to the XSL transforms, but was unfortunately outside the scope of the project and was not taken forward.

## Recommendations

1. There must be stricter version control to ensure the compatibility of the versions of ePET involved in the data transfer. It is very important to ensure that any changes made to either system are picked up by the other.
2. Agreement needs to be made between institutions as to what information should be transferred. This includes checking data protection and data ownership regulations. Ideally a common ground should be found whereby all institutions involved agree to passing the same information around. This can be quite limited as very little of the information stored within a portfolio system is required by the student on a long-term basis.
3. Some information must always be available to the student. This includes any files/documents uploaded to the portfolio and personal (CV) data, and possibly transcript information if available, but most course or institution-specific data is not necessary as it is likely to have little relevance to the student's future studies.
4. It may be possible to negate the need for an XML-RPC transfer. Taking a step back from the more technically advanced part of the work done, it is possibly more useful for the student to give them the option of downloading the data as a zip file. As previously mentioned, this could be stored on a flash drive with a dual purpose of marketing the institution. This would make transferring data from ePET to any other system (Blackboard, Pebblepad, Lucid) more straightforward.
5. IMS-LIP may not be the best method of transferring this data from ePET to ePET. Other standards are available including IMS-ePortfolio and UK-LEAP, which need to be investigated further. Additional standards such as HR-XML (for CV data) may allow each of the key portfolio components to be transferred more easily by using a more specific schema to transfer data from each separate tool.
6. In some circumstances, data does not need to be transferred from one academic institution to another. The use of web services could allow the core 'transferable' information to be held in external systems outside of the college/university and simply plugged in by the student when they move to their new institution. Course-specific data could then be managed and developed by the relevant institution. Some data would still need to be transferred (document uploads), but managing this would be much more straightforward than using the existing XML method.

## Conclusion

The EPICS project was a great success, providing case studies from Further and Higher Education to demonstrate that portfolio records can follow a student as they progress on their lifelong learning journey. The project looked at various techniques and methods, ranging from fully automated solutions through to relatively 'low-tech' user-initiated techniques. In addition to these technical achievements, the project has given significant insight into the complex pedagogic and socio-legal issues surrounding the use of and transfer of portfolio data. There are a relatively large and diverse group of partners within EPICS, the establishing of a regional PDP Forum is therefore an important outcome of the project, providing mutual understanding and sharing ideas and concepts for the spectrum of ePortfolio/PDP practices. Also, the 'Governance Tool Kit' produced as part of the project draws on some of the learning from EPICS in relation to the social, legal & ethical issues related to ePortfolios.

The EPICS partners are keen to continue to build on the achievements from the EPICS project, and to take forward the work that has been done. The first step in this is to keep the existing partnership in place and to build on the regional networks, such as the PDP Forum, in collaboration with other national and international initiatives. This will help answer some of the difficult questions raised by EPICS, such as what data should and should not be transferred, and what the legal and political implications of transferring student data are for the institutions and individuals involved. In terms of the technical work, continuous development is taking place to enhance the data transfer techniques, by investigating further the use of additional XML schemas such as UK-LEAP and IMS-ePortfolio, and the use of web services to host student data.

[i] Managed Environments for Portfolio-based Reflective Learning: Integrated Support for Evidencing Outcome,s http://www.eportfolios.ac.uk/FDTL4

[ii] IMS-LIP (Learner Information Package) specification, http://www.imsglobal.org/profiles/index.html

[iii] Study to Explore the Legal & Records Management Issues Relating to the Concept of the Lifelong Learner Record, http://www.jisc.ac.uk/index.cfm?name=project_learner_records_legal_study

[iv] UK F&HE Developmental LIP schemas, examples and documentation - UKLEAP specification, http://www.cetis.ac.uk/profiles/uklip/

[v] IMS-ePortfolio specification, http://www.imsproject.org/ep/index.html