

JISC DEVELOPMENT PROGRAMMES

Project Document Cover Sheet

Final Report

Project

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University of Central England
South Birmingham College (Lead Partner)

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1. Executive summary

The JISC Exchange for Learning Bank Project comprised 2 phases and work on Phase 2 was completed in July 2006. The aim of the project was to explore and implement reuse and repurposing methodologies and produce high quality learning objects for distribution using repository tools. Over the 4 years of the Project a range of outputs were produced including:

- 134 packaged learning objects
- 1 learning object tool, a videobuilder tool, and 2 object templates: an xhtml template and a quizbuilder
- reports and methodologies including a repositories report, a content review methodology and report, learning episode evaluation methodology and report, a repurposing methodology, a VLE testing report, additional technical reports
- training materials for reuse and repurposing and use of the videobuilder

The project built on collaborative approaches in the development of learning objects which was underpinned by a comprehensive development strategy. The development strategy addressed standards and interoperability and promoted a build policy which facilitated object disaggregation to promote reuse and repurposing.

The aims specified in both project bids have been met and the Project proved the feasibility of reuse and repurposing activity across a partnership where objects are made available for wider community distribution. The projects form a significant body of research in terms of e-Learning issues and development and provide a narrative and analysis on implementation of related methodologies. Learning objects and shells have been made available for wider distribution in the JORUM repository. Reports and methodology of note include:

- The content review report
- A copyright case study
- The reuse and repurposing methodology
- The reuse and repurposing key scenario evaluation report

The Project highlighted the significant design and technical tasks involved in the production of quality learning objects alongside findings which will impact on adoption of reuse and repurposing methodologies within the FE and HE communities, particularly in terms of the paucity of freely available virtual resources for use and reuse and the cultural and training issues which need to be addressed to embed reuse and

repurposing in teaching and learning practice. Finally, it should be noted that feedback from learners suggests that the use of learning objects in learning can enhance that experience.

2 . Background to the Project

The Learning Bank project work built on South Birmingham College's work in developing e-learning tools and content which included:

- interoperability work with the JISC Project which included the successful implementation of authentication, authorisation and packaging tools and technologies.
- development and content packaging expertise which has been developed as part of the College's content development strategy including work on design, packaging tools, accessibility issues, and technical issues relating to this area of work.

The College's e-Learning Content Development Team had established a proven track record of a proactive approach to disseminating good practice and in e-Learning through chairing the LearnWise VLE user group, speaking at Regional Support Centre events and delivering national seminars in Managed Learning Environments developments.

The above work clearly supported the call for the X4L Programme in terms of best working practices, awareness of emerging standards for interoperability and development of environments for sharing resources within institutions and beyond.

Phase One of the Learning Bank produced a significant body of research and development in learning object production, content distribution and reuse and repurposing methodology, most notably the content review report, the copyright case study, a repurposing methodology and the learning objects themselves. This work was the basis for successful Phase Two bid which of the project extended the work of Phase One and aimed to implement a key role workflow in order to further explore roles and tasks within reuse and repurposing methodology and focus on reusable shells or tools as a means of building learning object development capacity to meet the needs and challenges for reuse and repurposing activity as identified by Learning Bank Phase 1 and the X4L Review.

The Project was further supported by input from UCE's Learning Technology Development Unit and another Phase One partner college, Birmingham College of Food Tourism and Creative Studies.

3 Aims and Objectives

The aim of the Learning Bank Project was to re-purpose, package and tag existing and newly developed electronic materials for distribution via a learning object repository. Learning objects were to be tagged and packaged using XML and/or EML tools and technologies. Once objects had been developed and made available, the focus of the Project was to be on the use and reuse of Project objects and assets and the deployment of methodologies for tutors to create learning episodes using learning objects developed.

The Learning Bank Phase 2 extended the work of the original Project and aimed to meet the needs and challenges of repurposing and reuse for tutors/learning support staff, information intermediaries, educational technologists and senior managers by implementing scenarios which reflect the different roles and responsibilities within repurposing and reuse activities. Objects produced through this more focussed approach will further populate the JORUM repository with both objects and object development tools.

Both Projects aimed to support the JISC call by taking a proactive and dynamic approach to reuse and repurposing activities and issues which reflect the opportunities and challenges of this field of work and the aims of the Programme. Work will incorporate JISC tools, collaboration across X4L, other JISC programmes and a strong partnership based approach to project activity.

Objectives for the Projects included research, development, production and evaluation of the following:

- a methodology for reviewing and analysing digital content
- a methodology of content production, packaging, storage, retrieval and reuse which uses available tools and complies with the appropriate specifications
- a methodology for mapping digital content into the curriculum that can be used by tutors
- a series of existing and new learning objects to meet Project identified curriculum need
- methodologies for converting learning objects into learning episodes
- a methodology for trialling and evaluating content
- evaluation of all Project processes and products

- development of case studies based on the experience of the Project, which will include: copyright issues, pedagogical issues and technical issues,
- development of guidelines relating to areas of Project activity
- use of objects within curriculum areas, specifically business and catering
- development and delivery of a series of staff development events relating to the Project
- development of a Project website which will include communication functions for partners and the wider community
- dissemination of Project experiences and learning through a series of activities
- promotion of practical solutions for reuse and repurposing activities which is underpinned by recognition of the variety of roles and work flow structures for task completion
- maximising learning object development by providing quality learning objects and learning 'shells' for the community through JORUM
- incorporation of strategies to inspire practitioners to access learning objects in repositories and contribute reused/repurposed objects to build the capacity of JORUM
- incorporation of best practice in the application of standards and specifications in this area of work, for example, by using standard compliant tools and maintaining a strategy of working with open source software where possible
- promotion of the Project as a reference point for local, national and regional events relating to reuse and repurposing issues and practice
- integration of Project delivery and practice within the wider E-learning Programme, for example, by including expertise from UCE's Learning Technology Development Unit.

The original Learning Bank bid refers to the 'development' of the X4L Learning Bank repository. The development of a repository was seen as a potential area of Project activity. However, the focus of X4L Strand B Projects allowed for the Project to work closely with these Projects and make use of the tools and repository developments available. In this way the focus of the work centred around testing and usage of tools developed by other Projects

The Learning Bank project maintained its original objectives and did not undertake any significant changes to the original objectives of the project.

The concept of the learning object (as defined by the project) extended to incorporate the concept of reusable shells which support approaches to reusability and interoperability.

4. Methodology

Overall Approach

The project adopted an iterative approach to development with a focus on flexible solutions, modular design and development, a pragmatic commitment to inclusive design and active engagement of end users at all stages in development. The approach was underpinned by dynamic systems development methodologies, close adherence to emerging standards and specifications and usability and accessibility legislation. The approach also adopted a rigorous adherence to recommendations on accessibility and usability, which are now evident as legal requirements through SENDA and Human Rights legislation.

The Project also actively sought the support of specialist agencies such as CETIS, TechDis and guidelines developed by the NLN and worked closely with X4L Strand B Projects.

The usage of stable standards and specifications allowed effective and standardised work practices. However, the Key Role Scenario Workflows were sufficiently flexible to accommodate different working practices across the partnership.

The approach to the project promoted a collaborative approach to Project development. A collaborative working style within the team allowed for Project completion despite long term absences of key staff members. The approach to the project promoted a collaborative approach to Project development (by involving other institutions). It should be noted that the Learning Bank developed different relationships and working practices with the project partners due to cultural and institutional factors.

The Project was integrated in institution delivery through the location of the Project within institutional structures and this supported the success of the Project. The project also fostered a commitment to sharing findings with the wider community.

During the course of X4L Phase1 the team developed resource discovery and repurposing methodologies that the content team used to search out and obtain useful content from third party providers.

This approach was followed through in Phase 2. The Learning Bank also undertook a proactive approach in exploring tools and specifications relating to learner profiles, content and assessment specifications which included development work in the context of SCORM 1.2, IMS specifications, (content packaging, course packaging, student metadata and course metadata). It was intended that this approach would allow the project to address issues of both scalability and accessibility of content.

4.1 Content review, reuse and repurposing

The Learning Bank developed a methodology for the creation of content for learning objects which focused on the reuse and repurposing of existing freely available materials, and the creation of new materials to cover any omissions in the existing materials.

The focus of this methodology shifted in Phase 2 of the project (as a result of the experiences gained during Phase 1) to focus on the use of pre-existing materials obtained from project Partners.

The methodology was based on an iterative approach to development where each stage of the process was subject to evaluation and review. This approach was further developed in Phase 2 of the project through the creation of the Key Role Scenario Workflows which provided an explicit methodology and workflow for each of the four main constituent Key Roles which were those of:

- Content Developer
- Tutor
- Information Intermediary
- Senior Manager

The Learning Bank was required to produce a methodology for the review of content in order to underpin the reuse and repurposing process which was the foundation of the Phase 1 project.

The content review methodology was designed to:

- Ascertain the general availability of material and content freely accessible on the internet for the particular subject areas
- Ascertain and document any issues which relate to the material and it's use/re-use (such as copyright issues, usability, media mix, etc)
- Ascertain sources of material which will be freely available for use and/or re-use (re-aggregation) by the Learning Bank team to plug gaps in available materials

- Provide validation and justification for the learning objects which the team intends to create as part of the Learning Bank project.

The review of available content was conducted with reference to the following areas (as outlined in the project plan):

- Curriculum map of project
- Format of content and user end requirements
- Media mix of content
- Accessibility elements of content
- Granularity of content
- Copyright restrictions of content
- Potential uses of content and reusability rating
- Sample learning episode with content

Data collected in relation to the virtual resources focused on 2 types of data:

- Quantitative (Statistical data)
- Qualitative (Subjective data to assess the quality of a resource)

The different data types were utilised to provide the most effective analysis of content in order to facilitate the different outputs from the project.

Qualitative data was obtained through a scaling system designed to capture subjective judgements on resources by members of the content review team.

The content review utilised a Likert Scale which is a unidimensional scaling method based on a semantic interval scale (in this case, a scale of 1 to 5). It consisted of 'additive' items in equally appearing intervals where the data is rank-ordered and the scale is implicitly balanced and without bias. The Likert Scale was chosen as it is widely used in market research and has been the subject of extensive testing (in both marketing and social science literature).

The content review data gathering stage was based on a process of undertaking searches for relevant resources. The search process was structured into 2 tiers, with searches being conducted from:

- RDN (<http://www.rdn.ac.uk/>)
- The Web

At the end of the content review data gathering phase, the collected data was subject to an analysis phase in order to extrapolate findings for the review deliverables.

Resources were evaluated primarily in 2 ways:

- Statistical analysis (within information areas and across areas)

- Classification of categories to collate data for qualitative analysis (such as the suitability of a resource dependant on (i) level (ii) copyright (iii) elements of content (iv) any bias)

The results of the analysis were collated into a report which forms part of the deliverables for the content review.

It was necessary to produce a methodology for the process of repurposing resources in accordance with the stated aims of the Learning Bank Project Plan.

The Resource Repurposing methodology was intended to provide a practical guide for all aspects of the repurposing process including mapping the curriculum and learning objectives, choosing resources for the process and to the numerous issues which arise such as copyright, metadata and version control within a team.

The methodology was designed specifically as a process management document for use by the Learning Bank design team (content developers) rather than tutors, lecturers or I.T. support staff. As a result, it is implicit in the formulation of the methodology that the content developers are aware of how the Learning Bank will repurpose resources to facilitate accessibility, usability and reuse.

The methodology followed a step-by-step iterative process. Initial consultation with the Subject Specialist contact facilitated the creation of Curriculum Maps outlining the curriculum and any attendant learning objectives along with any particular pedagogical requirements.

This activity then informed the creation of Development Maps by the content developers which focus on educational mapping and technical (navigation/architecture) mapping including Metadata requirements based on UK LOM Core standards and Jorum repository metadata requirements.

The outcome of these activities was the development of a methodology which encapsulated a focused approach to the development of learning objects for a particular curriculum area.

Content developers ascertained an area to develop and choose resources for the area by using SQL Queries to interrogate the content review database (which stores data on resources relevant to the scope of the project). Resources were then validated by the Subject Specialist for their relevance and were subject to a process of

negotiation with the copyright holder regarding copyright status and potential usage. Resources which had been given copyright clearance were repurposed (or created if no suitable resources exist) to meet the learning objectives of the curriculum. These learning objects were then subject to a process of review and testing before aggregation for dissemination. All resources were subject to iterative evaluation by Subject Specialist and content developers at key points throughout the process to ensure their validity for use and repurposing.

4.2 Copyright

The Learning Bank needed to develop a methodology for all issues related to copyright and intellectual property.

The Learning Bank developed a methodology for ascertaining the copyright status of learning resources. Once deemed pedagogically appropriate, each of the resources was assessed for suitability in terms of copyright status before they could be reused or repurposed. Each of the resource providers were contacted to ascertain the copyright status of their materials: each resource provider was emailed with a standard letter which outlined the Project and Programme (based on the letter from Susan Eales, the Programme Manager), how we would like to use their materials and where the materials would be made available. The letter also requested a response to ascertain whether they did in fact own copyright for the stated materials and whether they would initially permit use of their material.

The initial email was valuable in giving the resource providers a simple and clear description of the Project and how the materials would be used. However, the project team recognised that the project needed a more comprehensive and legally sound document that would ensure confidence for the resource providers in the Project, legally cover the Project and ensure future proofing of the Programme when depositing objects in the JORUM repository. By producing a more detailed document the project could legally ensure that the resource provider was aware of exactly how the materials could be used as part of The Learning Bank and from the JORUM repository, any restrictions on our use (commercial gain etc) and also requirements from them (to state they were the copyright owner and were allowing use on the conditions stated).

However the project did not want to alarm resource providers by presenting them with a complicated legal document which may discourage them from contributing to the Project. It was deemed necessary to produce a copyright agreement to send to resource

providers that would cover the legal needs of the Project and Programme in a straight-forward manner using clear language.

The project initially contacted the South Birmingham College legal advisor and outlined the requirements for the copyright licence agreement as based on the needs of the X4L Programme (providing the JORUM licence agreement as an exemplar) - this information was then sent onto lawyers representing the South Birmingham College. A first draft was produced and returned to the project. The project found that it was necessary to clarify some of the repurposing terminology and rewrite areas to simplify the legal jargon. Once the appropriate alterations had been made, the agreement was returned to the lawyers to be validated legally. Once the document had been finalised the project possessed a customised copyright licence agreement that suited the needs of the project.

A signed copyright licence agreement was sent out to all of the resource providers with a list of the materials which the project wished to use and a basic description of the agreement. Each of the resource providers signed and returned the copyright licence agreement without any problems or need for clarification.

The content was used to produce learning objects with an acknowledgement for the resource provider in an introductory splash screen within the packaged materials and also in the metadata as agreed in the copyright licence agreement.

4.3 Object Design and Development

The technical strategy was underpinned by a measured and methodical approach to each development stage (as set out in the project plans for Phase 1 and Phase 2). Each of the outputs was intended to expand the knowledge and abilities of the Learning Bank Developers.

This strategy was intended to give the developers an excellent grounding in the relevant factors that guided the approach to design and construction of the Learning Bank outputs. It was also intended to ensure that the content produced would be as accessible to as many end users as possible and deliverable through as many learning platforms as possible.

The technical strategy for the Phase 1 project was underpinned by an initial research phase. The research phase acted as a means of refining the existing content development methodology developed by the

Learning Bank which was modelled on BECTA best practice documentation and previous experience.

The research phase included:

Review of tools and specifications related to the project:

- IMS specifications, emerging standards, including SCORM and EML.
- content packaging tools and underlying technologies
- examples of existing repositories and their underlying technologies

Creation of Methodologies to facilitate technical requirements:

- IMS Content Packaging and Metadata seminar
- SCORM Content Packaging and Runtime Environment seminar
- Repositories Report
- E-Learning Tools Review
- Content Review Methodology
- Repurposing Methodology
- Testing and Validation Schedule

The technical strategy for Phase 2 built on the experience of Phase 1.

The strategy for content development was intended to utilise:

- templates that were developed from work done for Phase 1
- standards compliant assessment tools such as TOIA
- Phase 2 Video Builder tool

The Learning Bank invested a great deal of time during the initial stage of the project planning the way in which learning objects would be designed and produced. Work completed prior to the beginning of the project had shown the Learning Bank team the importance of considering all aspects of object development including:

- The suitability of the content for development
- The relevance and accuracy of the content
- Aesthetic design
- Functional design
- Adherence to standards
- Testing

The Learning Bank also realised that it was essential for the project to define the terms to be used by the Learning Bank during the project in relation to resource repurposing. The Learning Bank has employed specific terminology which is based on (but not necessarily conformant

to) definitions used by other members of the community as a whole (such as the IEEE definitions).

The Technical Mapping process was designed to assist the Learning Bank team in the repurposing of resources and the creation of learning objects by providing a focus on the overall architecture of the learning objects and also on the navigational structure of an object (or a package of objects).

The Technical Maps were intended to provide information about

- How the actual learning objects will be designed (including folder structure and page layout)
- How the actual learning objects will be built (including the technical solutions, such as flash objects)
- Any technical requirements to facilitate this process

The Technical Mapping process consisted of two interlinked elements:

- Structure
- Navigation

The term 'structure' refers to the structural mapping process which is intended to provide a map or 'template' of how the content packages will look in terms of onscreen layout. The process of structural mapping also focuses on the underlying folder structure of the objects. The term 'navigation' refers to the navigational mapping process which is intended to demarcate and manage the ways that users can navigate through the content packages. The process drew on ideas developed as part of user centred design (such as paper prototyping).

The Learning Bank built on the interoperability and accessibility research undertaken during Phase 1 of the project to ensure that all HTML and XHTML templates used to produce outputs for the project included best practice with regard to the technical implementation of object development (where practicable).

The XHTML template used to produce Phase 1 Marketing objects was further developed and revised for use with Phase 2 Study Skills and Microscopy content.

It was realised that there was a need for users with low technical skills to be able to produce video objects of a similar style to the Hospitality and Catering outputs from Phase 1. To this end a Flash based Video Builder Tool was produced as part of Phase 2 and used to build video learning object outputs.

This tool was intended to resolve the accessibility issues around the delivery of video content by including the facility to caption the video and for those captions to sync with the video. All other objects produced using Flash were built with accessibility recommendations in mind and include keyboard navigation and audio tracks to enhance accessibility.

4.4 Standards

The Learning Bank developed a methodology in relation to metadata by a close and focused study of the relevant standards, guidelines and recommendations.

The project adopted UK CMF (Common Metadata Framework) Profile (now known as the UK LOM) which was developed as part of the X4L programme as a subset of the IEEE LOM. It was developed for use with content produced for the UK educational sector and as such became the default metadata application profile to be used with X4L outputs.

However the development of the JORUM Repository and the adoption of the Intralibrary system from Intrallect resulted in another metadata profile becoming available to the X4L projects.

The project intended to upload all of the outputs from the project to the JORUM Repository and consequently made a decision to utilise the JORUM metadata profile as the metadata profile used to define the packages. The project therefore adopted the JORUM metadata profile as the one used to define the Learning Bank outputs.

The project plan committed the Learning Bank to an investigation of content packaging standards and the holding of a seminar on the SCORM Reference Model. This was to take the form of a study of the IMS Metadata and Content Packaging specifications and a team based seminar on the SCORM Content Packaging specifications and the SCORM Runtime Environment, the AICC CMI Data Model and the SCORM API. To this end the Learning Bank held a team seminar that looked at the SCORM packaging and metadata model and the SCORM API and runtime environment.

The Learning Bank also produced and tested a SCORM Runtime Environment conformant Flash object and carried out extensive testing of both SCORM and IMS versions of content packages in a number of

Virtual Learning Environments including LearnWise 2, Moodle 1.4.3 and Blackboard Learning System (Release 6) - 6.1.5 Build 5.

The Learning Bank was aware that the area of Educational Technology Standards would evolve during the lifetime of the project and committed to packaging to the current standard as it stands at the end of each phase of the project or that are available via packaging tools such as Reload.

The Learning Bank is aware of the responsibilities placed on educational establishments by the Disability Discrimination Act 1995 and the Special Educational Needs and Disability Act 2001. In order to ensure that the outputs from the project comply to the acts requirements (as far as is practicable), the Learning Bank utilised and followed the W3C WCAG guidelines as a methodology for addressing accessibility.

The Learning Bank set minimum standards for web accessibility within the projects service standards which stated that all content will be developed to a minimum of W3C WCAG - A Compliance.

All content developed for Phase 1 and Phase 2 of the X4L programme was tested against the relevant W3C document type DTDs using either the W3C Mark Up Validation Service tool or the Dreamweaver in-built validation tool (where practical).

All objects have been checked and cleared for a W3C WCAG rating of AAA, where practicable.

The project also continued to assimilate developments and recommendations as set out on the TECHDIS and CETIS web sites.

The Learning Bank strategy for packaging focused on packaging project outputs using the latest tools and technologies available to the project.

The project decided on the use of the Reload tool after undertaking a Tools Review in the earlier stages of the project. It was initially envisaged that the XML Metadata files would be created manually using DreamWeaver. However, research noted that a review of content development and packaging tools should be conducted in order to ascertain the best possible tools for the development and packaging of the Learning Bank outputs.

The Learning Bank conducted an investigation into packaging of learning objects. This investigation took the form of testing of a number of objects packaged to both IMS and ADL SCORM formats in a number of repositories and VLE's. The exploration of packaging tools to facilitate the content development stage of the project looked at the following software:

- Reload
- LRN3 Toolkit
- Black Arrow
- Package it
- TOIA

Packaging of learning objects was undertaken using the Reload tool and the packaged objects were then uploaded to the JORUM repository.

4.5 Testing of Learning Objects

The Learning Bank developed a methodology for the technical testing of learning objects which was intended to provide the project team with all of the skills and knowledge required to design and produce high quality learning objects. The strategy included:

- Internal (functionality) testing within the Content Development Unit designed to highlight any navigation errors and spelling mistakes etc. This included code validation and accessibility testing with the Bobby tool as well as interoperability testing with a range of learning platforms to check package structures are created as expected
- Tutor validation to ensure that the meaning of content was not compromised or confused during the development process
- User testing with groups of students at the appropriate level to assess the reaction to the navigation, format, content and aesthetic qualities of the outputs

The success of this strategy was measured in terms of the volume of learning objects which:

- Received a positive score in W3C and Bobby testing
- Met the content objectives by the subject specialists
- Received positive feedback from user testing
- Interoperated with a number of learning platforms

The Learning Bank methodology for the testing of learning objects consisted of an iterative process where objects were subjected to testing (both internally and externally) before release.

Learning objects were subjected to:

- Alpha Testing
- Beta Testing
- Release Candidate

Alpha Testing involved functionality testing of the outputs conducted by members of the Learning Bank team. This process was intended to identify any problems with how the objects work (such as navigation problems, spelling mistakes, tab indexing, and so on). The objects were also subject to validation of content by the Subject Specialist. This process was intended to ensure that the content had been interpreted and presented correctly within each object and that the content is suitable for the intended audience. A user questionnaire captured data about the learning objects in both Qualitative and Quantitative form. The results of this process were documented using a validation checklist given to the Subject Specialists as a guide to the validation process. If any mistakes were identified, the learning object returned to the Learning Bank team for correction.

Beta Testing involved the review of the materials by groups of students on courses for which the content would be useful. After reviewing the materials the students were asked to complete a questionnaire that covered issues relating to the content including:

- Navigation
- Style & Design
- Content
- Performance of the Materials
- Overview of Materials

The user questionnaire captured data about the learning objects in both qualitative and quantitative form. The results from the questionnaires were logged on an Excel spreadsheet that presented the results in both textual and diagrammatic formats.

If any mistakes were identified, the learning object returned to the Learning Bank team for correction.

After the correction of any problems or issues brought to light by the Alpha and Beta testing stages, the learning object was considered to be suitable for release and therefore became a release candidate.

Re-testing of the materials may take place at this point if the necessary modifications indicated during alpha and beta stages are considered to have altered the objects significantly.

Technical Testing: Packaging

A methodology was also developed for the technical testing of the packaging of release candidate learning objects.

The release candidate object was packaged using Reload to form the structure of the package (which included basic metadata, title and description). The package was then uploaded to the JORUM repository. If the import was successful, the package was previewed to check that the content was correctly structured. If the structure was correct, the JORUM metadata editor was used to complete the mandatory fields and the technical fields.

The object was then given a classification. The classification was also subject to change by the RDN cataloguers if a more appropriate classification was available.

Once the structure of the package, the classification and metadata had been checked, the package was made available to the RDN cataloguers for completion of the metadata.

4.6 Distribution of Learning Objects

Distribution of Learning Objects: Repositories

The Learning Bank was committed to making the outputs of the project as interoperable with as many learning platforms as is practicable. The Learning Bank initially undertook a review of available repository technologies as a research tool designed to underpin the methodology for repository use within the project and to produce a set of recommendations in relation to the production of learning materials and their dissemination via repositories. The exploration of delivery platforms to facilitate the content development stage of the project looked at the following software:

- Intralibrary
- Xtensis
- HLSI

Initially, the framework for evaluation included data on all aspects of operation by the various organisations (as detailed in the project plan). This data was required as the project intended to create and maintain a repository for learning objects.

However, this was found to be unnecessary because of the JORUM (Strand B) project that was scoping the requirements for a national

repository and trialling both the Intralibrary and Xtensis repositories as possible technologies to be used as nation repositories. Subsequent to the Learning Bank discovering the intended JORUM development the proposed Learning Bank repository development was abandoned and the project plan amended to reflect this change and the new project plan was resubmitted to the JISC for approval with a commitment to use of the JORUM repository for the dissemination of learning objects.

4.7 Training

The Learning Bank team developed a methodology for the delivery of training in order to meet training needs ascertained by the project.

The methodology was developed to address the needs of the following groups of trainees:

- Internal - Learning Bank team
- Internal – Subject Specialists
- Internal – Information Intermediaries
- External – Project Partners

The methodology initially undertook a process of training needs identification through interviews with potential trainees. The results were recorded on questionnaires designed by the Learning Bank team which formed the basis for a period of analysis.

The results of the analysis period formed the basis for the development of training materials designed to meet the needs of the trainees.

Training was delivered by members of the Learning bank team. The training sessions took a variety of forms (designed to meet the training and learning needs of the trainees) including:

- Training days: Large group
- Training days: Small group
- 1-on-1 training sessions
- Seminar days

Training given was subject to a process of evaluation based around training user questionnaires which returned analytical data in both Qualitative and Quantitative form. The results of the evaluation were delineated in a report and were used to inform further refinement and development of the training program.

4.8 Evaluation

Project evaluation

The Learning Bank developed a strategy and methodology for evaluation throughout the duration of the project. Feedback resulting from the evaluation activities was used to inform the development of project deliverables, application of the implementation process and processes underlying the management of the project.

Evaluation activities were undertaken at programme, cluster, institutional and project level. The evaluation processes were characterised by:

- both formative and summative methodologies which will be employed throughout the life of the project
- collection of data that is naturally occurring using both quantitative and qualitative methods
- evaluation will be owned by all project participants and make effective use of time and resources
- evaluation data will be used as a basis for informed decision making and developing a coherent continuation strategy

An external evaluator was utilized to monitor the implementation of the evaluation strategy, to advise on methods and procedures to be used in the collection and analysis of evaluation data and to provide independent judgment on the outcomes of the evaluation.

Evaluation was conducted at 2 levels:

- project progress and processes
- project outputs and impact

The purpose of evaluation of the projects progress and processes was to monitor progress in relation to the aims and objectives of the project.

The purpose of evaluation of the project's outputs and processes was to monitor the effectiveness of the project's outputs and, specifically, to identify best practice in terms of

- use of content packaging and repository technologies
- creating learning episodes from learning objects
- delivering content to users

A range of evaluation methods were used appropriate to the context of the evaluation activities including:

- participant observation by the external evaluator at Steering Committee meetings, Project meetings

- review of Project documentation relating to the planning, monitoring, reporting and evaluation of Project activities
- interviews with key staff involved in the Project
- workshops
- surveys
- questionnaires
- structured interviews
- testing and trialing activities
- focus groups
- reflective logs
- development of case studies and guidelines
- the commercial developers community

Project evaluation also fed into evaluation planned through cluster groups and at Programme level.

An evaluation update was provided at each steering group meeting and included in the minutes of each meeting. An evaluation report was completed at the end of each workpackage. These reports formed the basis for the final Evaluation report produced by the project.

Learning Episode Evaluation

The Learning Bank developed a methodology for the assessment and evaluation of the use of learning objects in a learning episode.

The methodology was designed to obtain qualitative and quantitative data for analysis by the Learning Bank team.

The tutor undertook a learning episode with a group of students utilising learning objects created by the Learning Bank project.

After the learning episode, the students were asked to complete a Learning Episodes Evaluation Student Questionnaire which recorded their responses to both the form and content of the learning objects.

The students then undertook a Question and Answer discussion session with members of the Learning Bank team which was recorded on a Learning Episodes Evaluation Student Question & Answer Documentation document by members of the Learning Bank team. The document recorded data on subjective responses to the materials.

The tutor was then asked to complete a Learning Episodes Evaluation Tutor Questionnaire related to the use of the learning materials in a

learning episode with a focus on intended learning outcomes for the learning activity, use of the learning objects as part of a learning episode, the provision of feedback to users and the assessment of users.

The data gained from the questionnaires was then subject to a period of analysis in order to ascertain the effectiveness of the learning objects when used in a learning episode.

4.9 Dissemination of Project findings and outputs

The Learning Bank project recognised the critical nature of dissemination activities in promoting change and learning in the community.

The dissemination strategy for the project was designed to:

- Familiarise institution and partner institutions with project
- Raise awareness of the work of the Project and Programme and its context within Project institutions and wider groups
- Share experiences of working with learning objects, repositories and models of delivery
- Promote the project's plans, activities and outputs
- Share key role scenarios/experiences of reuse and repurposing of learning objects, repositories,
- Encourage dialogue and experimentation with project working methodologies
- Support the production of biannual and final reports

The project committed to taking an active role in project dissemination at project, programme and wider community levels through a range of activities including shared events, electronic communication tools, including blogs, shared documents and reports and the programme web space. The methodology for the dissemination strategy was designed to utilise a variety of dissemination channels in order to effectively disseminate the outputs of the project. The dissemination channels included:

- Training events
- Dissemination face to face events
- Communication mechanisms on the Project website for partners and a wider audience
- Participation in JISC mailing lists and events
- Publications for dissemination through electronic and conventional means setting out the future directions of this approach to learning
- Evaluative report on dissemination activities

- Evaluative report of the project as a whole
- Project website

The project team also participated actively in the regional cluster group for the West Midlands comprising face to face meetings at least twice a year, ongoing informal support and contact and additional meetings as appropriate. The project also operated as the rotating chair of the project.

The dissemination strategy focused on the following recipients:

- Peers
- Subject staff
- Technical support staff
- Partner staff
- Institutional senior management,
- JISC
- Project partners
- Project funding body
- FE/HE community
- Practitioners

5. Implementation

5.1 Planning Implementation

The broad plan for the Learning Bank remained robust through the life of the Project. Phases 1 and 2 were defined in terms of workpackages which were of suitable granularity in relationship to Project aims and objectives and were presented to show the relationships between the packages.

The workpackages were made available across the Project partnership and more widely through the Project websites.

As a general assessment it is accurate to report that the Project met its aims and objectives and, in this way, the planning of the Project supported Project execution and completion.

The major change to the Project plan was negotiated with the Programme Manager: an objective of repository development was redundant as this development was undertaken by the JORUM Project.

The tracking of workpackage progress was monitored through regular meeting, a range of additional documentation relating to

methodologies and reporting and this was further supplemented by the introduction of 2 additional planning tools:

- electronic development logs which provided a very useful means of tracking and communicating work progress relating to learning object development and other Project outputs
- workflows to further clarify the key role requirements to complete reuse and repurposing activity.

A number of methodologies to support implementation were developed at the outset of the Project these further supported implementation through the provision of clear and detailed guides to elements of the work including content review, curriculum mapping, learning object design, user testing and learning episode evaluation. These methodologies were developed as the Project progressed.

The Project team also engaged in a process of decision making around choices of tools to implement the Project plan which was underpinned by an agreed approach, or ethos, relating to Project aims. Choices were made on tools for object production, packaging and distribution. Choices were reviewed as part of an ongoing evaluation strategy. A review of implementation activities and experiences is given below.

5.2 Content review and curriculum mapping

Once decisions had been made on subject levels and areas to be addressed, a detailed mapping process was undertaken which was based on the team's approach to learning content development. This activity required close liaison with subject specialists to produce the necessary level of curriculum and educational information. It became apparent that the educational mapping (see methodologies) could be considered to equate to aspects of Learning Design. Tutors were generally confident and receptive to this area of activity as it was rooted in their everyday practice and, as a face to face activity, was technology free. Maps were written up and electronically stored and were used as the basis for resource discovery and content from scratch.

Content review

The hypothesis for content review activity was that freely available content could be acquired and used to produce learning objects to meet identified curriculum requirements.

To this end, the content review was undertaken by Project team members as an online, structured activity. The aim to capture comprehensive data on virtual resources meant that the review became an intense, time consuming activity which took a great deal more time than was anticipated and was a source of some stress for developers. The scope of the review was narrowed. Results of the review were electronically stored and, in the longer term were made available to the wider community via a database.

Lists of highly rated resources were passed to subject specialists for validation. Feedback from subject specialists informed the selection of content for development process along with a criterion identifying the resource as potentially copyright free.

As stated, this workpackage was hugely time consuming and yielded limited quality results and, in this way, the risks of content review activity should be considered carefully at the outset.

Copyright issues for e-Learning object development

The limited quality content results of the content review were further compounded by the outcomes of copyright clearance for object development. The process of preparing appropriate contracts, contacting potential providers with a legally binding document and acquiring clearance to use content resulted in 2 content providers signing up to the Project.

A lack of specific guidance and low returns from enquiries meant that the Project team planned for very limited content review in Phase 2 of the Project as it was considered to be an inefficient way of acquiring content.

The Project team also moved towards greater involvement of information intermediaries in the reuse and repurposing workflow and greater focus on tutor provided content for development.

Subject specialist content/technical mapping

Subject specialist content was provided for a range of curriculum areas and was based on the detail of the curriculum map. Content was made available in electronic format and was incorporated into the technical map for development.

It was found that checking of provenance of content with subject specialists was important as understanding of copyright issues was limited.

It was also found that significant time was required to re-write material and not having immediate access to specialists for this purpose meant that developers got involved in this, particularly in Phase 1.

5.3 Designing and creating learning objects

The design of learning objects was based on information from the curriculum map, additional subject specialist content, developer expertise and the Project's underpinning approach to design which included strategies to define learning objects and meet standards and specifications and create compliant objects for distribution.

User requirements were an essential element in the design of learning objects. These requirements were established largely through tutors and, in this way, the design was mediated by the tutor's expert knowledge of their subject and students.

The Learning Bank built on all of the interoperability and accessibility research done during phase 1 of the project to ensure that all HTML and XHTML templates used to produce outputs for the project included best practice with regard to the technical implementation of object development, where practicable.

It was realised that there was a need for users with a range of technical skills to be able to produce video objects of a similar style to the Hospitality and Catering outputs from Phase 1. To this end a Flash based Video Builder Tool was produced as part of Phase 2 and used to build video learning object outputs.

The videobuilder tool was created using iterative development paths and was used to produce the majority of object outputs for Phase 2 and, as such, is a major output of the Project.

Objects were built following the agreed technical map. Development of learning objects ranged from relatively straightforward to repurposing of text to html objects to the repurposing of Windows proprietary content.

The format of content provided for repurposing caused problems in terms of attempts to uncouple content from proprietary tools. This

impacted substantially on development paths and requirements to enhance the tool developed to meet user requirements from supporting text to presentation.

Object validation and testing

Object validation and testing was planned and implemented as a two tier activity to take into account content, intended audience, functionality (see methodology). This process worked effectively and confirmed the critical role of the subject specialists in the development of objects.

The validation and testing processes were developed by the team who felt more confident with technical testing than user testing.

Testing is a necessary but time consuming element in object development.

Packaging objects

Object packaging was implemented in the following manner:

- Once an object was deemed suitable for release, that object was then be packaged using Reload to form the structure of the package and included basic metadata, title and description, this package was then imported into JORUM.
- If the import was successful, then the package was previewed to check that the content is correctly structured.
- If the structure was deemed correct then the JORUM metadata editor was used to complete the mandatory fields and the technical fields.
- The objects were then given a classification. This classification may be changed by the RDN cataloguers if a more appropriate classification is available.
- Once the structure of the package, the classification and metadata had been checked, then the package was made available to the RDN cataloguers for completion of the metadata

The Project team implemented a strategy for packaging which developed from the tools review and implementation of the tool of choice, Reload.

The main issue that use of the packaging highlighted was the need to consider the distribution mechanism for packaged objects and the impact on design: objects delivered by VLEs will have a navigation

structure which is read from the manifest file whereas objects used as standalone objects will require an internal navigation structure. This issue impacted on a relatively small number of Phase 2 objects as most were designed with single page navigation. Where it was an issue, the team created different versions of the same object. However, concerns over metadata profiles led the Project team to agree on the use of the JORUM metadata editor for metadata detail to ensure as accurate data as possible.

Some of the initial uncertainty over approaches to dealing with metadata was reduced by the lead that JORUM took in this area although there was a period of time when the team was braced to research and assign metadata, a daunting task for most.

The strategy of engaging information intermediaries in metadata assignment did not become established as part of Phase 2 and this was largely due to timing of availability of the JORUM service and engagement of the RDN team for metadata. The Project team felt that information intermediaries on the Phase 2 Project were keen to get involved in metadata activities.

Issues which relate to this activity include the JISC/ Jorum amendment of its metadata strategy, the development of information intermediaries in this process and the longer term issue of packaging for different delivery options.

5.4 Distribution of Learning Objects

Using the JORUM repository

The Project selected the JORUM repository as the preferred repository for object deposit and distribution.

Over the course of the Project, the Project team developed positive working relationships with the JORUM team which facilitated research, development and engagement with JORUM.

The Project team's initial strategy for upload to the repository included a strategy to deal with content packaging, the Reload tool, and metadata. However, in implementation the focus of the work was on content packaging rather than metadata as JORUM revised their approach to this and engaged the RDN in metadata assignment.

The concept of interoperable objects for delivery across platforms was proven.

The Project contributed to the dissemination of the JORUM Project through making objects available for demonstration.

The Project was successful in engaging a number of key role practitioners in evaluating JORUM. It was less successful in embedding use of JORUM in practice: this is largely due to time scales and continuing cultural barriers to the use of repositories to search for content.

Distribution of objects in VLEs

The Project plan included objectives to disseminate objects via VLEs both in order to make objects available to students and tutors across the Project partnership and to test the concept of the creation, packaging, upload to JORUM and download, import and use of an object in a VLE.

Making objects available across the partnership involved working with partners to map objects produced to course delivery, making packaged objects available to partners for use in VLEs by depositing the object in the institution VLE or providing the object by different means. This was successfully implemented and sharing of objects was monitored throughout the Project. This indicated that the learning environment dictated access to objects: although VLEs are reasonably ubiquitous and embedded, learning environments do not always meet delivery requirements. The objects accessed were generally used 'as is', rather than reused in any way.

To test the additional mechanism of the use of JORUM to deliver learning objects to a wider community, sample packaged objects were uploaded to JORUM, catalogued by RDN and made live by the JORUM team. Objects were then searched for and downloaded by developers. Zip files were then imported into the relevant VLE location. This activity was firmly in the domain of the developers and there were very few tutors involved in the Project who felt that they had the time or skills to complete such tasks.

In technical terms it was possible to demonstrate that the objects could be imported to and exported from JORUM. The 'searchability' of the repository remains largely untested.

5.5 Using objects in learning episodes

The evaluation of use of learning objects in learning episodes was based on an iterative methodology which took into account developments within the E-learning pedagogy strand.

Instances of the use of learning objects were evaluated using a structured methodology to capture feedback from tutors and learners. Project team members negotiated access to learning episodes, completed the evaluation research and wrote up findings which were validated by the tutor.

In terms of the process of completing the evaluation it was felt that it was important to have different opportunities for learners and tutors to express themselves and a 'warm up' was helpful in encouraging feedback.

The episodes evaluated demonstrated that creativity and confidence in designing learning episodes were key to successful delivery. The learning environment was critical in learning episode planning.

Student feedback on the use of objects suggested that they had a positive impact on learning and improved learning.

5.6 Training

Training was planned as an activity across the Project to support intended aims and objectives and, as the Project progressed, this training became more integrated into institution based e-Learning development delivery. This integrated approach supported embedding of project activity within wider contexts.

The approach to training delivery followed standard processes of training needs analysis in relation to project requirements, for example, implementation of the reuse and repurposing methodology and use of the videobuilder tool, development and delivery of training, evaluation and review of training delivered. Staff development, particularly in Phase One also covered general VLE skills as these were seen to be important by project participants in designing and delivering learning episodes.

Training was delivered with face to face and online resources and comprised an experiential approach to learning which actively engaged

participants in using and developing skills which supported their teaching practice.

Training sessions were evaluated through formal and informal strategies.

5.7 Evaluation

Evaluation of the project processes and products was a significant element of Project planning and included different foci and methods.

The evaluation strands of both phases of the Project were ambitious and the analysis phases of a number of larger scale evaluation activities impacted on team resources. It was agreed that there was a tendency to concentrate on collection of additional data rather than analysis of already available data. It was agreed that smaller scale ongoing capture and analysis of evaluative evidence would have been more manageable.

The implementation of reflective logs across the Project team was difficult to establish as an ongoing, self directed activity. This was partly mitigated by the introduction of electronic development logs for all areas of Project activity. These logs were heavily used and provide a substantial record of Project experience. Much of the data is narrative and it would be useful to consider strategies to capture more reflective data in future projects.

5.8 Dissemination

The dissemination strategy for the Project took account of a range of methods and target audiences in the planning stage. Ongoing dissemination activities were implemented including face to face and electronic communication.

It was agreed that the most successful dissemination activities were those tailored to the stakeholders' key interest: managers were drawn to events and information which highlighted the potential of freely available resources whereas tutors were concerned with how such resources could be integrated into teaching and learning.

By targeting dissemination events the Project was able to bring together smaller numbers of people for more focussed dissemination.

The Project team found that the follow up from dissemination events was critical to ongoing participation of those involved.

5.9 Implementation of the Phase 2 workflows

Phase 2 of the Learning Bank Project extended the reuse and repurposing methodology by implementation of workflows which recognised the intended tasks for each key role. The workflows were shared with key role workers and progress was monitored and evaluated.

In implementation it became clear that a number of issues facilitated the effective engagement with the workflow: key role skill levels were critical; effective communication between key roles was also critical along with availability of easy to use tools to facilitate the work flows. The work flows assisted in clarifying roles, particularly in relation to the role of subject specialist although it was still the case that, as the key stakeholder in the Project, content developers were liable to take on additional key roles to progress the workflow.

Workflows were facilitated where the institutional structures recognised the collaborative nature of content development/ e-Learning activities, for example, through e-Learning champions. The workflows were also facilitated where there were existing positive working relationships between the key role staff.

5.10 Project management and processes

The Project was managed using the approach recommended by JISC and incorporated roles and responsibilities management structures.

The style of Project management was collaborative and participative and this encouraged an open dialogue with Project members. This was an important feature of the Project which encouraged the Project core team to take responsibility for their own work. This approach reduced disruption when Project members were on long term absence and facilitated changes in Project implementation where it was agreed necessary.

The ongoing management of the Project was supported by availability of well structured information which was available to the core team and regular meetings which included partners.

Project progress was further supported by a supportive and proactive chair of the Project steering group.

6. Outputs and Results

End result of project: research, reports and case studies

The Project completed a number of research based activities. The areas of research are listed below and are available on the Project websites. The results of research are also referenced in throughout this report.

- Repositories report: Oct 2003

Repositories were identified as emerging technology and the Project selected the JORUM repository as the best tool to meet the Project's aims.

- Content Review report: Oct 2004

Content review was identified as a time consuming and demanding activity which did not produce the expected outputs of substantial content for repurposing. This finding led the project to focus on other means of acquiring and producing content.

- VLE Testing report: Oct 2005

The VLE testing report proves the interoperability of packaged objects in 3 VLEs.

- Tools Review report (informal)

The tools review highlighted the issues relating to the use of proprietary tools in content creation.

- User trialling reports (various)

The user trial reports found that the learning objects produced were of value and the collaborative nature of development optimised the perceived value of the objects.

- Learning Episode case studies:

Learning Episodes: Catering and Hospitality

Learning Episodes: Business Studies

Learning Episodes: Access to Health Studies

Learning Episodes: Study Skills

Use of learning objects in learning was generally considered to be a positive development which enhanced learning.

- Workflow evaluation report: June 2006

The workflow evaluation report found that reuse and repurposing is a new area of activity with many challenges. The implementation of the workflow assisted the key role participants in understanding the scope of the work and their role within it. The workflow evaluation highlighted the need for substantial staff development and ongoing dissemination of repository tools and practice.

6.2 Learning Objects

The Learning Bank created a number of learning objects and tools/templates as part of the outputs for Phase 1 and Phase 2 of the project.

The learning objects were designed to address interoperability issues, meet other relevant standards and to provide the most suitable solution for developing the content provided for the intended audience. The 'shell' or tool approach to object development is reflected in make up of objects produced which are largely built in one of three ways:

- using an xhtml template suitable for text based content,
- using the videobuilder shell
- using the TOIA quizbuilder.

Where need dictated, one off Flash animations were created. The learning objects have been uploaded to the JORUM repository as part of the project outputs.

Objects can be described in terms of format and subjects covered
The following learning objects have been created and packaged:

Study Skills

The Library Object (1 object, 2 versions): a Flash object designed to introduce students to library studies skills through a 3D virtual environment available in 2 versions.

Study skills for level 3 students (5 objects, 2 versions): 5 html-based learning objects focussing on a range of study skills topics

Business and Marketing

Marketing (4 objects): 4 html-based learning objects focusing on specific areas of Marketing

Hospitality and Catering (65 objects): 65 objects demonstrating the preparation of chicken and fish for catering purposes

Radiography: Anatomy and Physiology (18 objects): 18
TOIA/Word objects covering body systems and cells
9 TOIA/ QTI/ word quiz versions

Radiography: Principles of Radiation Science (9 objects): 8
video objects with synchronised presentations covering the principles of
radiation science; 1 Flash animation object with audio presenting x-
Ray beam manipulation

Health Studies: Anatomy (10 objects): 3 TOIA/Word/Flash objects
covering cell components and directional anatomy
1 html microscopy object

Health Studies: Molecules of Life (8 objects): Flash/ html-
embedded animations showing food test experiments, including 6
individual animations

Sports Therapy: Electrotherapy: The hip girdle (1 object): 1
object demonstrating the parts of the hip girdle

Plumbing (10 objects): video objects demonstrating basic plumbing
practice.

6.3 Tools

The videobuilder

The purpose of the Video Builder is to provide a web-based environment (or 'shell') which is designed to enable tutors to create their own video lectures and/or demonstrations. Tutors will be able to easily package existing video material for online delivery using any Internet browser and with support for the widely available Flash[®] Player.

The Videobuilder offers more than a means for providing video content over an Internet connection. It also offers the capability to add informative captions to the video images and to add accompanying text or graphics in order to create an effective and usable learning material.

The Videobuilder has been designed to provide an easy-to-use interface: for example, the user can move forwards or backwards within the timeline of the video to provide the ability to go over the material as many times as necessary in order to ensure the best result.

The set of features available in the Videobuilder make it a flexible tool that can generate self-contained learning objects suitable for a variety of subjects. Learners will benefit from being able to review the material at their own pace and in their own time, and the Video Builder will provide tutors with an easy-to-access and easy-to-use solution for the creation of online video-based materials which can be delivered through Moodle (the college's VLE).

XHTML Template

An XHTML template was produced to meet accessibility, usability and design requirements for largely text based content. The template was reused by developers for content in both Phases of the Project.

The Flash Quiz Builder

A Flash based generic Quiz Builder was developed for an institution based Project and reused to create Flash based quizzes. The builder received very positive feedback from users in terms of look and feel and usability and was reused to create some of the quizzes in Phase 2.

6.4 Methodologies

The Learning Bank has produced a number of methodologies during the course of both Phase 1 and Phase 2 of the project.

The following methodologies have been made available on the Project website:

- Content Review methodology
- Repurposing methodology
- User Trialling methodology
- Learning Episode Evaluation methodology

7. Outcomes

For the purposes of this section of the report, a general summary of achievement against aims and objectives is given.

In order to differentiate the Phases of the Project and highlight the developmental nature of Phase One, aims for each phase are considered separately.

7.1 Phase One

Aim: To undertake the repurposing of materials

The project was able to repurpose freely available existing material as a result of the content review activity. The project team engaged in a thorough process of negotiation with content providers in order to secure permission for use of resources (as detailed in the Copyright Report).

However, the project had not anticipated the limited availability of freely available existing content when planning this activity. The limited availability of freely available existing content impacted on project plan timelines by expending more temporal resources than had been anticipated and by requiring detailed rewriting of certain elements of the content in order to meet the target audiences requirements. This impacted on the amount of repurposed content produced.

The impact of the content review process was also a defining factor in the evolution of the teams approach to content development throughout the timeline of the project. However, the Project was successful in proving that it is possible to secure freely available existing content for repurposing which is of good quality and meets user requirements. The project also repurposed newly developed materials in order to fill 'gaps' in the freely available existing content.

Aim: To package materials developed

The Project tested various packaging tools (Reload, LRN3 Toolkit, PackageIt!, Black Arrow, ECAT) and reported back to the community on the findings in a tools review (available from the Learning Bank website):

<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&sub-menu=4#item3>).

The 10 learning objects were successfully packaged using the Reload tool. The marketing objects were packaged as SCORM and IMS versions and tested in various VLEs (LearnWise 2, Moodle and Blackboard) and also in the JORUM repository. All of the objects were successfully uploaded and validated. The findings were documented in the VLE Testing report

(<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&sub-menu=4&sidemenu=4>).

Aim: To tag materials developed

The Project has completed rudimentary tagging with Reload and JORUM

(<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&sub-menu=4&sidemenu=2>) . Mandatory and classification metadata was added to 10 learning objects successfully using the JORUM metadata feature. The experience of using these tools has been documented (<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&sub-menu=4#item3>).

As the Project progressed the approach to metadata changed from a focus on individual Project responsibility to a Programme level approach at JORUM. Whilst this revision of metadata strategy had the effect of reducing the development team's experience of metadata, the team has been able to report back to JISC and others on this area of work

(<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&sub-menu=4&sidemenu=4>).

Aim: To make content available

The Project took a pragmatic approach to object access which ensured the earliest possible access to objects for partners and the wider community. The project aimed to provide a number of access mechanisms for objects which had an impact on the developmental approach to the learning objects (as the learning objects would be required to function in different environments).

Objects were released in the following formats:

- CD Rom
- Web accessible via development logs
- Packaged and uploaded to a repository

The project has made the developed content available to the host institution (South Birmingham College) and to the project partners (University of Central England and Birmingham College of Food and Tourism). The content has also been made available in JORUM for access by the wider community.

A broad measure of levels of access (in terms of 'hits' to the objects in institutional VLEs in September 2005):

University of Central England

Study skills - 146

Business (Marketing) - 32

Hospitality and Catering - 3

Birmingham College of Food, Tourism and Creative studies

Study Skills - 64

Business (Marketing) - 38

Hospitality and Catering - 45
South Birmingham College
Study Skills - 212
Business (Marketing) - 85
Hospitality and Catering - 354

The analysis of learning objects in use within a learning episode indicates that tutors are in favour of availability of packaged objects through institutional VLEs. This may have implications for the interoperability of learning objects.

There is no evidence of significant repurposing of objects accessed.

Aim: To monitor the use and reuse of Project objects and assets

The Project had set out to establish the use and reuse of project assets and objects and planned to use a number of strategies to monitor this. At this stage in the Project, the most significant research and development has related to the use of objects:

- within a learning episode
- within a VLE

The project has undertaken in-house tracking of object usage using the tracking facilities within the Moodle VLE at South Birmingham College.

Object use has been most closely evaluated through the Learning Episode Evaluation case studies which have taken place at South Birmingham College involving 5 tutors and 65 learners. Most of the learning objects produced by the Learning Bank project have been used in learning episodes.

The objects have also been used across the partnership, with trialling of the learning objects at one of the partner institutions.

The Project has also identified the limitations of current packaging practice (specifically a lack of facilitation of the use of assets within an object).

The project has addressed the issue of the reuse of learning objects by extending the concept of reuse to 'shells'.

The project has extended its own understanding of repurposing and the definition of learning objects: a learning object is not necessarily a

'one-off' item. The project has undertaken a modular user interface development path which allows for many more iterations of an object.

Aim: To develop and share methodologies

The project developed the following methodologies:

- Content Review methodology- a methodology for reviewing and analysing digital content
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=2>
- Repurposing methodology - a methodology for content production (including content production, packaging, storage, retrieval and reuse which uses available tools and complies with the appropriate specifications)
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6>
- User Trialling
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=3>
- Learning Episode Evaluation Methodology
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=4>

Aim: To develop and share case studies

The following case studies has developed the following case studies:

- Learning Episode Evaluation: Catering
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=4>
- Learning Episode Evaluation: Business 1
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=4>
- Learning Episode Evaluation: Business 2
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=4>
- Copyright: The Learning Bank Experience
<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=2>

Aim: To undertake evaluation of Project

The Project implemented a rigorous monitoring and evaluation framework in order to capture as much information and feedback on Project products and processes.

The evaluation of the learning objects was documented through the user trialling and testing process across the partnership, by students and subject specialists (<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=3>) and also the learning episode evaluations (<http://moodle.sbc.ac.uk:81/thelearningbank/index.php?menu=4&submenu=6&sidemenu=4>).

There was a uniformly positive response to the range of product outputs including the objects themselves. The positive response was also demonstrated through feedback from the Learning Bank website and requests for use of the learning objects (for example from Reid Kirk College and Suffolk College) and also a request for an article on the Project from the 'New Review of Information Networking' publication.

The team evaluated processes and products through the forums, development logs, methodologies and reports. The team also incorporated feedback to reports from JISC and the Cluster groups, advice from partner institutions and feedback from user trials & subject specialists.

Aim: Delivery of Staff Development Events

The staff development activity within the Project was based on a partnership agreement which took an integrated strategy to staff development around issues relating to:

- learning object development
- development of learning episodes
- use of new technologies and tools

This approach assisted in the embedding of project outputs and methodologies into the mainstream of e-learning developments. It was also considered essential to link dissemination activities to staff development opportunities and there is evidence of links between dissemination attendance and training take up at all institutions.

Each partner organisation committed to incorporating X4L outputs and methodologies within their e-learning programmes. Institutions delivered training as part of ongoing staff development which has been evaluated.

The Project exceeded its target aim in training more than 200 staff in the use of X4L objects delivered via VLEs for teaching and learning.

There was limited opportunity to train staff on the use of Reload and JORUM because of the developmental nature of the tools and this activity took related more to dissemination than training.

The support for tutors in the use of learning objects took the following form:

- What is X4L ?(presentation) - All partners
- What is Reload ? (demonstration to partners) - All partners
- What is JORUM ?(demonstration to partners) - All partners
- Moodle for Beginners - SBC/UCE
- Moodle Advanced - SBC/UCE
- Blackboard for Beginners - BCFTCS
- Blackboard Advanced - BCFTCS

Evaluation feedback on training in use of objects and repositories was positive. For the 250 staff who undertook some element of training, 90% felt the training was 'good' or 'excellent' and had relevance to their teaching and learning delivery. This strategy was successful in terms of embedding outputs and linking project outputs through staff development and institutional planning.

7.2 Phase Two

Aim : To implement reuse and repurposing workflows for identified key role workers

The Project achieved its aim of implementing the key role scenarios across the Partnership. The purpose of the workflow was to clarify reuse and repurposing roles and tasks in order to increase the effectiveness of the activity. All workflows were implemented and, to a large extent, the tasks identified within the workflows were undertaken by key role people involved.

Each work flow had its own particular path and it emerged that some tasks were more heavily exploited than others. This seems to relate to the skill set and 'comfort zone' of the individual engaged in the Project. A general assessment of the implementation of each is given below:

Information intermediary

The key workflow tasks undertaken across the partnership related to resource discovery using virtual resources and accessing NLN content via Moodle, not repositories as such. This area of activity provided

valuable resources for use 'as is' and some NLN content for reuse and repurposing. The Project was unable to test the JORUM/ reuse and repurposing scenario with information intermediaries.

The assignment of metadata for objects was not addressed as the JORUM team instigated an alternative strategy to metadata assignment. The area of information intermediaries and metadata assignment remains largely unexplored although there is a willingness to embrace such activity.

Tutor

All tasks within the workflow were undertaken and evaluated. Tutors were at their most confident in talking about their subjects and how they teach. In this way, developers were able to capture vast quantities of tacit knowledge relating to students, subject and learning and capturing this through Learning Design would be an excellent extension of this work.

As would be anticipated, ICT skilled staff were more engaged with reuse tools than others and were more able to fully engage in all workflow tasks. The implementation of the workflow highlighted the continuing issue of tutor skills in e-Learning tools.

Content developer

Content developers have maintained a significant role in the reuse and repurposing methodology and all workflow tasks were undertaken and evaluated.

The scope of interactions of developers with other key roles, and with tutors in particular, was dependent on the skill set of the interactants. In some cases tutors were relatively independent whereas in others, significant levels of support were required to meet the workflow output.

Aim: To maximise learning object development by providing quality learning objects and learning 'shells' for the community through JORUM

The Project achieved this aim through the development, dissemination and planned distribution of the Videobuilder which provides a user friendly tool for the production of video objects.

The Videobuilder has created great interest in the HE/FE community through dissemination of an early version by JORUM and this feedback has been passed on to the team. Although this evidence is largely anecdotal, it suggests that the tool development approach to reuse and repurposing has great potential.

From initial feedback from tutors, it is possible to claim that the design and build of the Videobuilder tool has facilitated reuse and repurposing through provision of an interface which removes the need for users to have knowledge of the Flash development environment. The tool has been used by developers to build objects across the partnership but it is too early to show wider use.

Aim: To incorporate strategies to inspire practitioners to access learning objects in repositories

The Project implemented a number of strategies to promote the use of repositories with practitioners including: developing a tool which, although high end media, can be used with relatively minimal training; incorporating into JORUM into workflow processes; incorporating into JORUM into dissemination activity, for example, links from the Learning Bank 2 website; providing a JORUM training day for the Project partnership and integrating JORUM dissemination into staff training.

Aim: To incorporate best practice in the application of standards and specifications in this area of work

The benchmark of best practice in the application of standards and specifications has been adhered to throughout the Project and has included reference to WC3, QTI, IMS Content Packaging, SCORM, UKLOM/UKCMF, IEEELOM and CETIS guidelines.

The Project has followed the developments in Learning Design although a decision was taken early on in the Project not to implement these standards as tools available were insufficiently tested and the general mood in this area was one of caution.

The use of standard compliant tools has been adhered to and extended into the choice of open source tools where possible, for example, the Project team has made extensive use of the Reload, and TOIA and has produced the videobuilder as a cross platform object builder.

The Project has embraced open source tools where possible and has provided valuable feedback to tool developers.

Aim: To monitoring and evaluate Project activity

The Project implemented a rigorous monitoring and evaluation framework in order to capture as much information and feedback on Project products and processes.

The evaluation of the workflow implementation and other project processes and tools have been evaluated through the following:

- Questionnaires
- Informal discussions
- Forum discussions
- The object development logs

The Project processes

The team evaluated processes and products through the forums, development logs, meetings and reports. The team also incorporated feedback to reports from JISC and the Cluster groups, advice from partner institutions and feedback from user trials & subject specialists.

The workflow implementation evaluation

A workflow evaluation report has been produced based on various sources of data including a substantial questionnaire.

The scope of this questionnaire comprises

- Training
- Tools evaluation
- The workflow itself
- The key role skill set
- Working across the Programme
- Dissemination activities

Objects

The evaluation of the learning objects was documented through the user trialling and testing process across the partnership, by students and subject specialists

There was a uniformly positive response to the range of product outputs including the objects themselves. The positive response was also demonstrated through feedback from the Learning Bank website

and requests for use of the learning objects (for example from Reid Kirk College and Suffolk College) and also a request for an article on the Project from the 'New Review of Information Networking' publication.

The Project had set out to monitor the use and reuse of project assets and objects and planned to use a number of strategies to monitor this. At this stage in the Project, the most significant research and development has related to the use of objects:

- within a learning episode
- within a VLE

The project has undertaken in-house tracking of object usage using the tracking facilities within the Moodle VLE at South Birmingham College.

Evaluation of Learning Episodes

Object use has been most closely evaluated through the Learning Episode Evaluation case studies which have taken place at South Birmingham College involving 4 tutors and learners. Most of the learning objects produced by the Learning Bank project have been used in learning episodes. Case studies of the learning episode evaluation process have been produced.

Monitoring of usage of objects/tools developed

The Project had set out to establish the use and reuse of project assets and objects and planned to use a number of strategies to monitor this. Due to Project timings, the most significant research and development has related to the use of objects within learning episodes and within VLEs.

It is too early to comment on wider reuse but can the Project can report interest from JORUM colleagues and Learning Bank dissemination events, for example, the RSC EAST Midlands e-fair and the libraries induction dissemination event coordinated by UCE.

Aim: To serve as a reference point for local, national and regional events relating to reuse and repurposing issues and practice

The Project has achieved the aim of functioning as a reference point through Project website development which is highly searchable and

accessible. The website has been well received by the wider e-Learning community and the Project has established a number of links through website contacts.

The Project has presented methodologies and outputs at Programme level and at regional events, particularly through strong working relationships with the West Midlands RSC.

The Project has also networked with other national e-Learning projects, particularly X4L SURF and the e-Learning Programme and Project outputs have been disseminated in this way. The Project continues to enjoy a national profile through the promotion of Project outputs via JORUM.

Aim: To integrate Project delivery and practice within the wider E-learning Programme.

This strand of the Project has been successful in terms of:

- sharing staff training resources across the partnership
- sharing staff expertise across the partnership
- integrating wider programme developments into Project processes, for example, evaluation of learning episodes content from the e-Learning programme was used.

Aim: Delivery of Staff Development Events

The staff development activity within the Project was based on a partnership agreement which took an integrated strategy to staff development around issues relating to:

- learning object development
- development of learning episodes
- use of new technologies and tools

This approach assisted in the embedding of project outputs and methodologies into the mainstream of e-learning developments. It was also considered essential to link dissemination activities to staff development opportunities and there is evidence of links between dissemination attendance and training take up at all institutions.

Each partner organisation committed to incorporating X4L outputs and methodologies within their e-learning programmes. Institutions delivered training as part of ongoing staff development which has been evaluated.

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- What is JORUM ?(demonstration to partners) - All partners
- Moodle week and X4L objects - SBC
- Moodle for Beginners - SBC/UCE
- Moodle Advanced - SBC/UCE
- Blackboard for Beginners - BCFTCS
- Blackboard Advanced - BCFTCS
- Reuse and repurposing training workshops All Partners
- Videobuilder training 1. Introduction All Partners
- Videobuilder training 2. Creating Learning Objects All Partners

Evaluation feedback on training in use of objects and repositories was positive. For the 200 staff who undertook some element of training, 85% felt the training was 'good' or 'excellent' and had relevance to their teaching and learning delivery. This strategy was successful in terms of embedding outputs and linking project outputs through staff development and institutional planning.

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8. Conclusions

8.1 Working Strategies

Planning

It is vital for any project to ensure that a clear strategy and implementation plan is developed at the beginning of the project in order to ensure an effective output of deliverables.

The strategy (which should be delineated in the Project Plan) should be shared with all relevant project workers and partners at the earliest opportunity.

Working across a Partnership

The process of working across a partnership should be supported by the use of effective communication strategies to facilitate collaboration, dissemination and evaluation.

8.2 Working Practices for Development

Mapping

The development of a methodology for Curriculum Mapping is an important tool in the effectiveness of the development of learning objects. The process underpins the future development stages of an object and ensures that all materials have a sound subject, pedagogic and technical basis.

Content Review

The project notes that the process of undertaking a review of freely available content available on the web is too time consuming and is, consequently, an inefficient method for identifying materials for reuse and repurposing.

Key Role Scenario Workflows

The development and implementation of key role workflows helped to clarify roles, duties, and workload and has been proven to be an effective way of working. It is recognised that training in implementation and workflow tasks is vital.

The required skill set for tutors to engage fully in the tutor key role in reuse and repurposing means that many tutors are, as yet, unable to fully exploit the workflow but it is recognised that engagement with the workflow will be incremental in nature.

Information intermediaries have emerged as an underused resource in reuse and repurposing activity and should be encouraged and supported to work more closely with tutors and developers.

Content developers still take on substantial quantities of the reuse and repurposing workload, which can be detrimental to their specialist

work. Developers should be encouraged to work more closely with other key roles to create effective objects. Although senior managers may be removed from the day to day practice of reuse and repurposing activity, it is vital that they are engaged and support reuse and repurposing development.

8.3 Technologies for Development

Repositories

Repositories are still a new technology and still developing, although JORUM seems to have established itself as the preferred tool at national level. The ability to search effectively will be a key factor in repository success.

Tools

In terms of content creation tools, the choice of tool depends on purpose and the expertise of the user. Clearly, not all tutors will wish to develop skills in the use of high end content production. Where possible, developers should be encouraged to work with tools which are not tied into proprietary delivery platforms. VLEs as a teaching tool are more standardised and ubiquitous now than at the outset of the project and as such can be considered an effective tool in object distribution.

4.4 Development of Learning Objects

Content creation

It is important for projects to define a content creation strategy to create effective working and outputs. It is important to have ongoing engagement between developers, tutors and learners in the production process.

Testing

Testing can be a time consuming and laborious task but, as a necessary part of the development process, a clear strategy should be available. It is also important to highlight user input as an essential element of object development.

Content packaging specifications

As a new and constantly changing area of object development it is considered important that developers keep abreast with changes in content packaging specifications. However, projects need to make a decision on what set to work with at an early stage in development and adhere to them.

Copyright Agreement

Copyright is seen as important area to address which should have greater direction from agencies involved.

8.5 Dissemination and training

Training

Training is an essential element in embedding new tools and ways of working. Throughout the course of the Project training on the use JORUM was limited and should be extended.

Dissemination Activities

In planning dissemination a variety of strategies needs to be considered which make use of as many channels as possible. Project and programme teams should consider the stakeholders and communicate what is necessary at their own level: dissemination material should be repurposed for the target audience.

Continuation & Sustainability Activity

Project teams should maximise opportunities to promote and incorporate Project outputs and outcomes in institutional planning and development.

8.6 Use of Learning Materials

Evaluation of Learning Episodes

The Project team has gathered and evaluated evidence to support the view that, from a learner's perspective, the use of learning objects can enhance the learning experience.

It is seen as a longer term aspiration to have tutors accessing learning objects in JORUM and reusing and repurposing these objects for use in

learning episodes. Most tutors do not currently have the skill set to achieve this independently.

Dialogue with Tutors on design and usage of materials has been an important factor in Project success. The transferability of objects to different teaching and learning contexts remains unexplored.

8.7 Evaluation

Project Evaluation

The Project team has found that evaluation should start early on in the Project cycle as it needs to be iterative throughout.

Evaluation Activity

Evaluation must begin at the beginning and be iterative throughout project. A range of activities should be implemented to encourage a number of ways of facilitating evaluation.

9. Implications

9.1 Working Strategies

Planning is time consuming and should be factored in to Project activity. The Project plan should be a primary tool in Project delivery and decision making.

Approaches

A participative approach to Project management encourages ownership.

Working across the Programme

Effective engagement with the Project partnership will facilitate development of Project outputs and outcomes which will be of benefit to the wider community.

9.2 Working Practices for Development

Mapping for reuse and repurposing

Projects should consider educational mapping (an element of the Project's reuse and repurposing methodology) as an effective approach to learning object development.

Content Review

Content review should not be considered as a primary source for significant content development activity.

Key Role Scenario Workflows

Key role workflow scenarios should be considered as a workable model in reuse and repurposing methodologies.

9.3 Technologies for Development

Repositories

More work needs to be done in the area of use of repositories for resource discovery, reuse and repurposing as they remain largely untested.

Tools

The development of learning object tools for sharing should be considered as an effective development strategy for funded projects.

The choice of tool for development can impact on object accessibility.

9.4 Development of Learning Objects

Content creation

Content creation should be approached as a collaborative activity.

Testing

Testing with end users should be incorporated into learning object development.

Content packaging specifications

Content packaging is key to the successful sharing of resources.

Copyright Agreement

More work is required in the area of copyright.

9.5 Dissemination and training

Training

Training is key to embedding new tools and ways of working.

Dissemination Activities

Dissemination activities should be carefully targeted for maximum effect.

Continuation & Sustainability Activity

Project teams should maximise opportunities to promote and incorporate Project outputs and outcomes in institutional planning and development.

9.6 Use of Learning Objects in learning Episodes

Learning objects in learning episodes

Learning objects can be used to enhance learning and teaching experiences.

9.7 Evaluation

Project Evaluation

The Project team has found that evaluation should start early on in the Project cycle as it needs to be iterative throughout

For further information see separate reports:

The Learning Bank Phase 1 and Phase 2 Technical Report

The Learning Bank Evaluation Report