

The Learning Matrix

Final Report

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Table of Contents

Acknowledgements	3
Executive Summary	4
Background	6
Aims and Objectives.....	7
Methodology.....	8
Key decisions	8
Methods used.....	9
Implementation	10
Initial investigations	10
Components of the project.....	11
Phase 1: Technology	11
Phase 2: Learning Delivery	12
Interoperability with institutional systems.....	13
Outputs and Results.....	14
Outputs.....	14
Evaluation.....	17
Outcomes	19
Conclusions	20
Implications	20
Regional implications	20
Further development	21
References.....	22
Appendixes.....	23
Appendix 1 List of project documents referred to in the report.....	23
Appendix 2 Report on Technical development delays.....	24
Appendix 3 Statistics on Learning Packages and Learners	26

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and the project management group

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The technical implementation was carried out by

Selwyn Lloyd and his team at Phosphorix Ltd with contributions from Dave Parry and Gareth Roberts of Liverpool Hope University

The partners in the project were

Liverpool John Moores University, Lead Institution
Connexions Greater Merseyside
AimHigher Greater Merseyside
Knowsley Community College
St Helens College
West Cheshire College
The University of Liverpool
Liverpool Hope University
Edge Hill College
University College Chester
Liverpool City of Learning
Learning Skills Council Greater Merseyside
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Executive Summary

Summarise highlights of the project (one page), including aims/objectives, overall approach, findings, achievements, and conclusions. The full report may include technical terms, but try to keep the executive summary in plain English.

The Learning Matrix project was undertaken to achieve two linked goals for the Cheshire and Merseyside region. The first was to provide the technological resources that would allow the region's educational institutions to co-operate in the active and seamless support of our local learners through their life-long and life-wide learning careers. The second goal was to pilot a type of regional service that would make use of these technological tools to encourage and support non-traditional groups of learners to engage meaningfully with their options for higher education.

The pilot service aims to reduce barriers for non-traditional students entering Higher Education by giving them easy access to a range of short "HE taster courses" offered by the region's educational institutions. The learner portal developed for the Learning Matrix also includes assistance for personal development planning (PDP) with activities designed to help learners reflect and assess their skills and interests which they can then relate to learning opportunities. The outcomes of their learning are recorded in a learner record which can potentially be used to support applications for further courses or employment.

The technology built for the project was in place by November 2005 and links 3 HE and 3FE institutions with hardware and software interfaces. The linked institutions use the technology to describe and publish information about courses they are offering to the Learning Matrix, process applications for enrolment and manage the learners on the courses offered. Other facilities allow them to interoperate with their own local databases, and to communicate learner information where appropriate. All these activities take place through the use of emerging standards for interoperability between educational institutions.

The "HE Taster" service was piloted in early 2006 with 54 learners being offered a choice from 13 learning packages provided by the 6 institutions who made them available by using the Learning Matrix interfaces. All learners undertook the PDP activities and enrolled on courses "online" using the learner portal. In all 39 learners have completed their learning packages so far and most are expected to complete shortly.

The project has received the full support of its participating partners and has made very good progress toward achieving its aims in a limited time. The learners in the pilot were able to register, use the PDP facilities and enrol on learning packages without problem. The institutions successfully used the administration interface to add and schedule courses, accept enrolments and confirm course completion. The details of the completed learning package then became part of the individual's Learner Record. We were pleased to work with the XCRI project in developing a specification for a course metadata standard for the UK, and have been the first to use the standard.

In the course of the project areas for future development emerged that we hope to take up at a later stage. It had been hoped to include ePortfolio facilities for the pilot, but instead these will be added at the end of the project as a reciprocal benefit from the work of projects who built on our initial work. The PDP activities provided for learners, though appropriate, will need further refinement if they are to be fully engaging and valuable as reflective tools. On the technical front a start was made on interoperability with institutions' own networks and databases but there is still much to be done in the areas of linking course catalogues and learner databases with the Learning Matrix systems, and in facilitating access to resources such as VLE's and libraries.

In conclusion the Learning Matrix project has provided a technological base that other lifelong learning initiatives in the region can build upon, and that may provide a model for Lifelong Learning Networks elsewhere. A service offering HE taster experiences has been piloted, and a

cohort of learners have already benefited from this. The challenge is now to embed the achievements into the educational landscape of the region by nurturing this and other related services to promote widened participation in further and higher education, and lifelong learning opportunities.

Background

HEIs and FECs in Cheshire and Merseyside have long experience of working together in partnership, and an enviable record of widening participation initiatives. Some past collaborations include: the HEIs involved in the Liverpool City of Learning initiative which has been active in facilitating various educational projects on Merseyside since 1993; the DfEE-sponsored LUSID project for the development of a personal development planning software, led by The University of Liverpool; the development of a common framework for Assistant Practitioner foundation degrees across the sub-region, a consortium of four HEIs and eight FECs to create an academic development partnership with the NHS University, membership of Aimhigher partnerships for widening participation (a Merseyside initiative became the model for Aimhigher); the New Technology Initiative, a consortium of HEIs and FECs funded by the NWDA, that acts as a single gateway to FE and HE across Cheshire and Warrington.

This background of collaborative work includes several previous ICT-related projects such as the Cheshire and Merseyside Modular Scheme (CAMMS) which is a protocol agreed between the NHS University consortium in the subregion to move towards a technology-mediated system for supporting work-based learning in the health and social care areas, whereby students can accumulate credit towards qualifications by studying modules from more than institution. A second project was the Learning Bites project, attempting to provide unified access to credit-bearing e-learning chunks from the HEIs. Initiatives like these identified barriers in several areas including inter-institutional access to resources, maintaining and communicating student records as well as obstacles arising from administrative system incompatibility and funding regimes. In the technological aspects, this project is needed to push at and overcome some of these barriers allowing such initiatives, for which there is a clearly perceived need, to go forward more smoothly.

Solving technological problems is of little interest unless the technology is going to be used to achieve something of value, in this case to promote increased progression to Higher Education by non-traditional categories of learner. The choice of the kind of service that the project pilots is based on the notion that non-traditional learners face various barriers to becoming involved in Higher Education routes. Some of these barriers may arise from incomplete or mistaken knowledge and understanding of what HE is like and who it is for. Family and peers may well have no direct experience themselves of Higher Education, unlike more traditional HE entrants whose parents may well have assisted in preparing for such a path. A “Higher Education Taster” service would aim to reduce the barriers to progression by giving the learner a better understanding of educational progression options and practical experience of learning at levels beyond their current level.

The rationale for such a service can be appreciated through this scenario seen from the learner’s viewpoint. This scenario has inspired and directed the design and implementation of the Learning Matrix project.

“Jenny is a student at Knowsley Community College. She is wondering about going to University but no-one in her family has HE experience and she is unsure what to do. The college advisory service suggests she look at the Learning Matrix.

Jenny logs into her college network and finds that there is a section about Learning Matrix on the college student intranet, and registers herself as a Learning Matrix user. She notices that there is information about ‘HE preparation courses’ at several colleges and, unsure about what she wants, she clicks for “guidance” which takes her to a personalised page. There she finds a range of options inviting her to think about herself and her learning (Personal Development Planning). She is led through a set of simple questions and gradually a picture is built up about her objectives and her personal skills. One point is clear: to study the area that she is becoming interested in (marketing) at University is going to require better writing skills. Jenny notes these conclusions in her PDP file stored in the Learning Matrix.

Using links in the page navigation, Jenny finds a writing skills programme that is offered mainly via the web but requires her to attend three group sessions in Liverpool. The writing skills programme is provided by Hope University, and she can see that there are places still available. She clicks to request enrolment, provides some information in a simple form and is told that her enrolment will be confirmed within the next two days. An email to her preferred address (an SMS message to her mobile phone was an optional method) arrives the next day confirming she is on the course and directing her back to her Learning Matrix area. Logging in, she now sees details of the course she is registered on in her personal area, and clicks to gain access to Hope's learning systems, where all the information she needs about the course is available. She is enrolled on the short programme and joins a virtual tutor group of about ten other students from across Cheshire and Merseyside. Much of the learning materials are accessed and interacted with via the web.

Jenny attends the three evening sessions that form part of the course and really enjoys the atmosphere, and the confidence the little course is giving her. When it's over, she finds the information about the course has been updated to include her marks for a piece of submitted work and confirmation of how well she did. She decides to mark this information as "available for inspection". She also decides to use a PDP tool to make a statement about her writing skills to be included as evidence when she later uses the CV creation wizard.

Jenny can continue to register for learning packages and build up her PDP file. As she does this, her achievements are recorded for her in a Lifelong Learner Record. Later, Jenny decides to apply to a Liverpool John Moores University, who are given access to her Lifelong Learner Record and a Web Portfolio she has created to supplement her application. "

What Jenny benefits from here is a service that lets her find out about what her options are, and get some practical experience of studying at these levels. As she does this, she is led to accumulate evidence and the skills to take her forward. The Learning Matrix aims to start the process of turning this into a practical reality.

Aims and Objectives

The project, though focused on widening participation to HE, is expected to open up technologies and processes that can be used in a wide variety of lifelong learning situations, including the delivery of continuing professional development opportunities at a range of academic levels and opening up the possibility of genuine credit accumulation and transfer between institutions across the region. Thus the pilot project is seen as only the first stage in a longer journey to improve access to higher education for all learners.

The overarching **Project Aim** is to enable non-traditional students considering progression to Higher Education to access appropriate learning opportunities from a partnership of FE/HE providers via a standards-based electronic interface. Within this aim, the **Main Objectives** are:

1. To develop a learner interface, the Learning Matrix, that presents a unified view of, and access to, learning opportunities within the sub-region.
2. To offer a personal development planning facility via the Learning Matrix that provides advice, diagnostic support and reflective opportunities for participant students, and to consider the integration of ePortfolio tools with the LUSID system to support and enhance the use of the interface.
3. To deliver learning opportunities in partner FECs and HEIs that will enhance learner preparedness for HE.
4. To develop an interface for institutional staff of the HEIs/FEIs in the partnership to facilitate:-
 - a. The description and publication of course descriptions (metadata)

- b. The management of student enrolments
 - c. The viewing and updating of learner records
5. To evaluate the systems, tools, information flows, learning experiences from the project to gauge the potential for sustainable future practices.

These objectives were unchanged over the course of the project, except that 4th objective was given more detail.

Methodology

Summarise the overall approach taken and why this approach was chosen over other options considered. Then describe the methodology in more detail. Depending on the project, this might include the methodology for research you carried out, technical design or development, evaluation, etc. Finally, note any specific issues that had to be addressed by the methodology, e.g. standards, interoperability, scalability, etc.

Key decisions

The method of approach to the Learning Matrix flowed from some key decisions on several points.

Distributed versus centralised approach

The Learning Matrix project focussed on a practical endpoint, which is to make the experience described in Jenny's scenario a practical reality. Research showed that previous JISC projects in the Managed Learning Environments (MLE) programme have approached some of the problems and issues, and could provide a good starting point. Broadly speaking there seems to be two possible approaches. The first approach would be similar to the NIMLE project in Northern Ireland. In this project, the attempt to provide a learner record reflecting progress in any of a large number of partner institutions was approached by creating a **centralised** data store and information flow. An alternate approach of **distributed** data held in the institutions being collected or accessed is exemplified by the SHELL project in the southwest region. This particular project developed a technology approach called **ioNodes** for transporting and collecting data. The approach adopted in the Learning Matrix was the decentralised, distributed approach because this seemed more likely to meet the broader aims of supporting a variety of different regional services.

The Provider Autonomy principle

In considering the kind of service to learners that could be offered it became clear that the most acceptable plan was one where each institution is completely in control of, and responsible for their own learning offerings. This is distinct from an arrangement where, for example, a joint programme of learning is created with its own management processes, and possibly shared resources and common elements delivered in different institutions. This can be characterised as a principle of **provider autonomy**, each institution managing its own quality and student management processes with respect to its own offered learning packages.

Need for PDP

The consequence of this decision is that the coherence of a learners experience has to come from elsewhere. The obvious candidate for this is the learner him or herself, supported by whatever Information, Advice and Guidance they have access to but also supported by the Learning Matrix services. The kind of support envisaged was to engage learners in Personal Development Planning activities designed to promote an understanding of their skills and interests, and to assist in the collection and preparation of evidence in support of a progression path. In short, we needed to provide **PDP and ePortfolio** facilities.

Lifelong Learner record

The last element in this picture is some means for the learner to collect together an accurate and up to date record of all their learning episodes, and for institutions who are approached by a candidate to be able to view such a record. The SHELL project had already implemented a system supporting Lifelong Learner Records, and so was the natural starting place for this project.

Methods used

Project organisation

The organisation of the project was an important factor in the method, because a large number of institutions of different types needed to be fully involved.

- A **project management** group consisting of a representative from each of the active institutions was created to support the project manager, and to provide a point of contact into the institutional structures. The members of the group took responsibility for their own institutions contribution to the overall project work.
- **Academic coordinator and technical coordinator** roles were defined to manage in detail the two main aspects of the project.
- It was decided that the allocation of the budget between the members was to be done on the basis of defining the tasks that needed to be done, agreeing appropriate funding levels for each task and asking for the partners' to take on the tasks. The alternative of signing up to a formal consortium agreement and sharing the budget between partners on some notional basis of degree of involvement seemed to risk vital work being left in a limbo with no-one taking responsibility for it. This system adopted worked well for the most part and the tasks and the responsibilities undertaken are listed in a separate document (appendix 1)

The project is broadly divided into two aspects: the creation of an enabling technological base, and the piloting of a service using the technology. Taking the pilot service first:

A Higher Education Taster service

The "Higher Education Taster" service aims to reduce the barriers to progression by giving the learner a better understanding of educational progression options and practical experience of learning at levels beyond her current level. The methods used to put together the service were;

- Identify in partner institutions about 10 – 15 short (10 learning hours) learning packages (LPs) suitable for the service. The timescale of the project meant that the LPs must not be subject to lengthy formal approval processes in their institutions. Project budget was allocated for supporting the individuals involved in preparation and delivery of LPs.
- Work with the partners involved with the potential client group (Connexions, LSC) and others on a learner recruitment strategy.

Technology framework

This "vision" entails the unification of business and ICT systems of partner institutions, the distillation of ideas and tools developed in dozens of previous JISC and other projects, and the containment of these in some sort of future-oriented standards-based view. Given the range of functionality envisaged and a limited budget, proprietary commercially available technological solutions did not seem viable. For interoperability reasons, flexibility and cost the choices were seen to be in open-source tools of the kind supported through the JISC.

The system was envisaged as based on Java technologies, utilising web services and SOAP for transport, xml data formats, and deployed in a distributed architecture. The locally developed and widely known PDP system LUSID was identified as the means for adding this service to the learner interface. The Shibboleth approach was a candidate for authentication and authorisation issues. At the outset it seemed likely that the technical expertise needed to implement such a system was available in the academic and support departments of the large number of partners.

The tasks at the outset of the project were:

- Consult with IT support teams in the partners to determine available skills, and get a perspective on the potential problems and pitfalls.
- Research and decide the technologies to be used, and allocate development tasks. The general approach was to build a system based on distributed services (web services and SOAP) using relevant existing XML specifications where possible.
- Liaise with the LUSID team at the University of Liverpool with regard to adapting LUSID
- Engage with discussions and developments of relevant specifications and standards through CETIS and CRA and attempt to incorporate the latest developments.

After Phosphorix Ltd were engaged to adapt the ioNode approach to the needs of the project, the tasks revolved around design decisions in discussion with Phosphorix staff. The ioNode approach is based on common open-source software including FreeBSD, Apache, Tomcat and all additional software developed to support the project is also available on an open-source license.

Implementation

Describe how you planned and implemented the project work and the activities it involved. Depending on the project, this might cover technical development, processes, how you conducted user studies, etc. Include any problems or issues that arose and how you handled them, where readers can learn from your experience. Tell the story of what you did rather than listing workpackages.

This section of the report will describe in outline the course of implementing the plan for the Learning Matrix, highlighting issues that emerged in the process.

Initial investigations

The early stages of the project involved extensive gathering of information from IT support and academic departments in the institutions involved. Potential technological solutions were investigated through the JISC project listings. The main conclusions from this were:

- (a) The expertise in the technologies envisaged was unevenly spread. A simple survey document was sent to all IT support departments involved (see the list of supplementary documents in appendix 1), the returned responses showed that some institutions had some staff with expertise in open-source java technologies while others (including larger institutions) had none at all.
- (b) In the timescale of the project, releasing personnel for significant amounts of time to work on the project was not going to be easy.
- (c) The processes and systems for student records, course catalogues, network access etc differed widely between institutions.
- (d) There were potential learning packages already in existence, or that could be developed in the timescale
- (e) The ioNode approach developed by Phosphorix Ltd for the SHELL project was an elegant solution well suited to the needs of the Learning Matrix
- (f) There was an overall willingness to engage with the project and an enthusiasm for what it was trying to do.

Components of the project

The project was divided into seven separate but interacting components so that it could be managed more effectively, and responsibilities allocated. The exact nature of each component evolved over the course of the project and with hindsight there could have been simpler structure. The components and their initial descriptions were:

- 1) **Learning Delivery**
Selecting and preparing an initial portfolio of learning packages. Recruiting a cohort of pre-HE students and supporting them through the process.
- 2) **Personal Development Planning**
Designing personal development planning activities and implementing them in the LUSID system. Adapting LUSID to work with IMS LIP/UK LEAP specifications.
- 3) **Course Information**
Technological and business processes for formally and consistently describing courses/modules/learning packages. Technology to collect together course information from different institutions and to make it available in a portal.
- 4) **Learner Records**
Systems for the storage, retrieval and amending of student records of courses taken, outcomes etc. in IMS LIP/UK LEAP format.
- 5) **Learner Portal**
A unified interface for students to access all parts of the Learning Matrix system.
- 6) **Shibboleth authentication and authorisation**
Creation of a trusted network employing the Shibboleth standard to allow students access to resources at different institutions with a single sign on.
- 7) **Project Evaluation**
Processes to assess and report on the success of the project

Phase 1: Technology

The first phase of implementation, the technology aspect, began with the appointment of Phosphorix Ltd as the project's developers and technical consultants in April 2005. A period of intense design activity followed resulting in a use-case analysis and a requirements document for software and hardware needs, both of which are listed in appendix 1.

Emerging issues in planning:

- A decision was taken to insulate the project from the high risk that interoperation with institutional systems would not happen in some or all cases. The result was a design that could be made to work through manual intervention, but had the potential for later full interoperability
- The intention to add ePortfolio facilities was put on a lower priority as being both beyond the project resources and in a state of uncertainty with regard to standards and specifications.

The work on developing the technology base and implementing it on hardware continued over the summer of 2005. The completed system ready for the start of phase two, learning delivery, was delayed by several weeks for reasons explained in an appended document (Appendix 2). A significant issue was that the solution for the PDP services to be offered, the open source LUSID system, proved difficult to mount despite efforts by all concerned. A substitute system was put in place which fell short of the original intentions to some degree.

Issues in technology implementation:

- The scale and complexity of the tasks became obvious during the planning, and there was a careful balance to be made to bring this phase to completion within budget. In particular, decisions had to be made about what was essential to the character of the project and what was desirable but would have to be left until

later. The “extreme programming” approach favoured by Phosphorix, involving rapid prototyping followed by continuous feedback and re-working cycles, fitted well with the nature of the project as it evolved itself. The resulting state of continuous flux was managed through the excellent communications and positive working relationship established between Phosphorix and the project personnel.

- When the systems were functioning and had met testing standards in “lab” settings, training was arranged for the project staff who would be involved in using the systems. The training session revealed problems only apparent in multi-user situations, and significant changes had to be made.
- There was continuous feedback to the developers, including a maintained document of outstanding issues (appendix 1). The overall result was a product in a more advanced state of development.
- The solutions developed for the Learning Matrix were found to be useful for other projects in the same strand, notably EELLS in Hertfordshire. EELLS subsequently engaged Phosphorix to develop ePortfolio facilities including a CV creator and web portfolios. These will be included in the Learning Matrix after delivery is complete.

Phase 2: Learning Delivery

The learning delivery aspect of the project overlapped considerably with phase 1 in that learning packages had to be planned and prepared, and arrangements for recruiting learners needed to be made. This aspect of the project got underway fully with the appointment of an academic co-ordinator in April 2005.

The three elements of this project component were identifying and preparing suitable learning packages, agreeing a format for metadata to describe each course offering and planning for the recruitment of learners to the pilot.

Choice of Learning Packages

Identification and choice of learning packages was done in conjunction with the project management group members, each of which was able to provide an “inside view” of an institution’s potential offerings. A potential problem for the project was in the narrow range of modules that could be made available given the time and resources available. As a pilot project, the task was only to demonstrate the feasibility of a full service, and we could not aspire to creating a complete implementation. Some 16 candidates emerged and these were considered for appropriateness to the needs of the project’s future learners. There was a degree of overlap in some offerings and final number of packages was reduced to 13.

Course metadata

Information about the learning packages was required from each of the provider institutions, and this was to be harvested into the learner portal so students could make informed choices.

Although the project could have been content with inventing a suitable format for this data, the objective of creating a standards-based system was important. A separate JISC funded project (the XCRI project) was considering and developing the basis for such a **metadata system**, and the Learning Matrix has collaborated closely with that project to implement the first versions of the resulting standard. An early candidate schema was available and this was analysed for a possible mapping to the project. A subsequent meeting with the XCRI project team clarified the potential application to the Learning Matrix and contributed to the development of the standard. The analysis is listed in appendix 1 and available on the project website. Anthony Beal has presented at a number of events, describing the place of XCRI in the Learning Matrix. The course metadata was collected from the tutors offering learning packages on a paper proforma and added to the actual data in the learning matrix after careful consideration.

Learner recruitment

The academic co-ordinator was able to work closely with Connexions to identify potential groups that could benefit from the Learning Matrix service. These included

- Level 3 groups that do not traditionally progress to university.
- Level 2 groups as tasters.
- Adults introduction to Access
- Connexions customers who have not previously considered university or who may realise the benefits of HE but do not believe they have the skills to cope with third level education

In addition to this the academic co-ordinator worked closely with college advisors in recruiting institutions.

At West Cheshire College he accompanied college advisors to a Perceptions seminar and offered an opportunity for delegates to use the Learning Matrix. Perceptions offers support and guidance to women interested in careers in jobs where women are not traditionally engaged. As a result three women enrolled on a learning package offering a taster in all aspects of the construction industry.

Issue: There were uncertainties about how the match of “supply” to “demand” could be managed for a relatively small number (13) of learning packages and potential learners (50 projected).

In the event, the start of the delivery phase was delayed by several weeks as a knock-on effect of the delays to the technology implementation. As anticipated, there were some learning packages (4) that did not receive enough applications to be viable for delivery. There were, in the event, no learners recruited through Connexions.

Issue: The particular issues emerging from the use of XCRI course description metadata will be considered later. A general issue is that many of the “standards” that were considered for use in the Learning matrix are not in fact standard at all. Some are in the early stages of development as specifications and most are far from being widely adopted. Phosphorix have tried to build their systems so that changes in standards can be fairly easily dealt with in the future.

Interoperability with institutional systems

Information flow between Student Record systems, Course catalogues and the Learning Matrix

The Learning Matrix systems were designed so that when the learning delivery stage started the connection between the Learning Matrix and local data systems could be effected through manual intervention if necessary. There are, of course numerous potential obstacles to the smooth flow of information and data, through incompatibility of data, systems and business processes. A portion of the budget was allocated to investigations and demonstrations of methods for connecting systems. The IT support department at Liverpool Hope University was centrally involved in this aspect and worked towards a webservice-based demonstration of a connection to their SITS system. SITS is quite widely used, so this was anticipated to be of value beyond Liverpool Hope. Phosphorix supported this work, which went smoothly. The report on interoperability work and outcomes is listed in appendix 1.

Shibboleth and Authentication/authorisation

A separately funded aspect of the project looked at the potential of the Shibboleth approach for solving problems of access to eLearning resources. The Shibboleth technology is very new, and it became clear very quickly that the only expertise with this technology was at the University of Liverpool, where a different project involving Shibboleth was being conducted.

The Shibboleth system is new and very complex, and additionally the use of it in the Learning Matrix context did not map directly onto existing models. Unfortunately, prior commitment of time prevented the University of Liverpool experts from making a substantial contribution to the work. The project manager, in the role of technical co-ordinator, allocated some time to acquiring the necessary skills to lead this aspect of the project. This work was not expected to produce a usable result in the timescale of the project, but to establish the methodology for eventual implementation. The investigation looked at how Shibboleth might be used to simplify access to multiple institutional systems from the learner perspective. In an ideal scenario a learner should be able to get at all the resources needed in any of the institutions they may be studying at by supplying their learning matrix credentials. A prime consideration was also that a Shibboleth implementation should not require specialist knowledge in institutional IT support departments, and should operate “out of the box” when the learning matrix hardware is added to a network. The need for this is underlined by the experience of one of the staff in a partner college, himself familiar with the technological platform, who reported that “.. unless someone comes up with an easy to use installer or at least good quality documentation, then I really cannot see this being adopted widely as average IT people are simply not going to be able to get this working at all in it's current state.”

The work looked at all the software variants using Shibboleth architecture, and with working “lab” systems investigated their potential to satisfy these requirements. A demonstration was produced connecting learning matrix accounts to an institutional resource (the Learning Design player SLED) at Liverpool Hope University. The full report is listed in appendix 1.

Outputs and Results

Explain the end result of the project work in an objective way. Depending on the project, it might include research results, findings, evaluation results, data, etc. If the project created something tangible like content, a portal, or software, describe it. Engage the reader, and avoid a long list of deliverables.

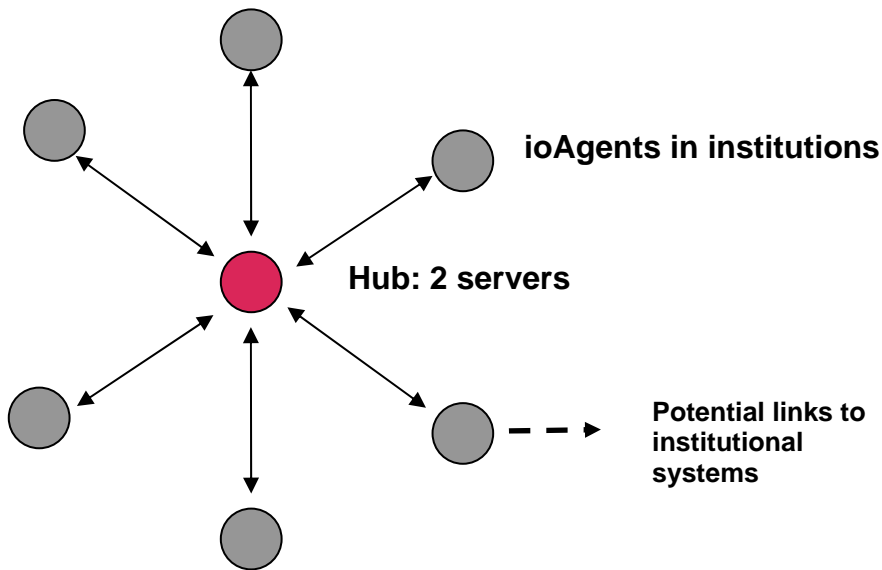
Outputs

The output of the project in the technological sense is a configuration of hardware in a network, and two main interfaces. There is a learner interface and a corresponding interface for Learning providers. A full technical description of the system is available in document listed in appendix 1 and a brief description follows here. In the non technical area, the output of the project was the provision of courses in a unique manner and Learners receiving a valuable learning experience through the system. Other outputs were associated with interoperability investigations and Shibboleth work. It is difficult to convey how a distributed system with such a broad range of features works, but one way is to go through a complete cycle from beginning to end as follows.

- (1) An academic or administrator creates a course description using the Admin Portal (AP)
- (2) The course is scheduled as an offering using the AP and passed on to the Learning Matrix Hub (LMX)
- (3) Optionally, a learner uses PDP facilities to assist making choices using the Learner Portal (LP)
- (4) The learner using the LP views information about the available offerings and decides on the course mentioned above in steps 1 & 2, and applies to take it
- (5) A tutor using the AP decides whether to accept the application, registers the learner on local systems (by whatever means) and confirms acceptance to learner via AP

- (6) Learner appears in Class Lists on AP
- (7) Learner is notified on LP of acceptance and usually a live link to learning resources becomes available.
- (8) After successful study, a student is “signed off” using the AP
- (9) The successful learning experience appears as part of the Learner Record on the LP

Hardware configuration and supporting background services



Conceptually, the hardware consists of 8 servers, known as ioNodes, in a hub-satellite configuration. The ioNodes are a private network isolated from other networks and communicate via webservices in a secure way. The ioAgents are situated in the institutions who offer learning packages.

The **hub holds central databases** and harvested data, and manages the Learner portal. The ioAgents holds a **database of Learning Packages** belonging to that institution, and support the **Admin Portal**. A number of services are deployed within the secure and auditable messaging framework to convey data packages in xml formats to storage destinations.

Interfaces

Full descriptions are available in the technical specification document referred to previously.

In outline, the interfaces support the following functions

The Learner Portal

The portal has these facilities:

- Personal details editing and store
- Personal development planning functions
- View of Learner Record
- List of learning packages

The Admin Portal

The Admin Portal is where course descriptions are created, and sessions scheduled. It also receives applications from learners and allows the learners to be managed.

- Personal details editing and store
- Management of courses
- Management of learners

Learning delivery

54 Learners were recruited for the project and 46 completed some PDP activity and a Learning package. In all 13 Learning Packages were offered and 9 of those recruited students and were actually delivered. This exceeds our target of 50 learners recruited and 35 completing a learning package. A full list of the packages and their recruitment figures etc. are in appendix 3

Interoperability

A full technical report on the interoperability investigations is available. In summary, a webservice connection was made to a SITS management system. The connection allows data to be drawn from the existing course catalogue and mapped to the XCRI schema used to carry metadata about learning matrix courses. This data was used to prepopulate a course description in the learning matrix ioAgent, so it could potentially be offered to the Learning Matrix. Re-using course information in this way is clearly far more efficient than starting afresh, though the utility of this depends on the mapping. In future, if the XCRI work has an impact nationally there could be a more complete mapping. A demonstration of the connection can be arranged.

Shibboleth

A full Technical report on this component is available from the project website and listed in appendix 1. In summary, the Identity Provider component of a Shibboleth system is operational on the Learning Matrix hub and can supply a number of attributes about a learning matrix registrant to a resource in an institution. Detailed investigations were undertaken to establish the best method to use as the other main set of components in a Shibboleth system. These protect a resource in an institution and are known as the Service Provider component. The objective here was to provide a Service Provider component on the ioAgent located in the institution so there would be no need for detailed knowledge of the Shibboleth system in order to deploy. Considerable expertise is normally needed given the current state of development of the Shibboleth software, and this is not usually available in an institution. A demonstration of one possible approach to access to resources on these lines has been developed. The work will be taken further by Phosphorix.

Evaluation

In this section the project and its impact will be evaluated. The project has been characterised by a continuous evolution and adaptation to circumstances, and in keeping with this the evaluation strategy adopted was formative, emphasising continuous monitoring and response cycles. The project evaluation will consist, in large part, of looking back over that process and in comparing the achievements of our work with our intended outcomes. The members of the project management group, who have been the individuals most directly involved in Learning Matrix activity, were asked to reflect back over the project around a loose structure of open questions. An analysis of the comments in those reports contributes to this evaluation.

Main issues emerging from reflective evaluation

The Project Management group members, who were the most involved in the project in each institution, reported on their experience with the following questions as a guide.

- Give a brief description of your level of involvement
- How did you manage feeding LMX learners into your local systems?
- Who used the management interface and how well did that work?
- What issues arose?
- What insights into learner reactions can you give?
- What issues need to be addressed for the future, including improvements and additions to the interfaces and tools?

Considering these evaluative reports, and comments made over the project lifetime, the project has been well received overall. However, it was not without problems and issues and the following areas of concern were widely noted:

The stability of the technology

There were annoying glitches in the systems until late into the delivery phase, which sometimes rendered the system unusable. The cause was eventually located in the systems that

institutions use to “cache” (store and re-use) web information, and a solution was straightforward. Recent performance has seemed much more stable.

The matching of supply and demand

It is unfortunate that some learning packages were prepared but not delivered because no students applied for them. The planning attempted to offer a balanced range of packages with relevance to the anticipated learners, but the choices of actual learners determined the final outcome. Edge Hill College were the most affected and none of their offering actually ran. This may have had something to do with the fact that Edge Hill is at the geographical extreme of the partnership’s catchment. It could be argued that recruitment of the learners was somewhat artificial and did not fully represent the anticipated pattern in that some learners were recruited onto courses at the institution where they were already studying.

Throughout the delivery planning Connexions have been very supportive of the potential for the service for their clients. It was hoped that some Connexions clients would be recruited to use the service but none came forward.

Connexions were especially interested in using the Learning Matrix technologies to engage with clients in such areas as: those on probation, young people preparing to leave care and those living in single mother’s hostels. It was believed by the Steering Group that the pilot could not offer a level of service to benefit these groups. It is hoped that a more mature incarnation of the Learning Matrix could be a very useful tool to these and other specialist client groups.

Although many of the students were recruited from within partner institutions three students were recruited from the Perceptions project during a two day seminar at Burton Manor on the Wirral. The project offers support and guidance to women interested in careers in jobs where women are not traditionally engaged. The Learning Matrix seemed to be particularly suitable for an event and group such as this. The women were very keen to engage with the project and were disappointed that there was not a wider range of learning packages on offer.

Personal Development Planning activities

As described above, the intention to incorporate LUSID as the PDP tool in the Learning Matrix was not realised because of technical difficulties. The University of Liverpool team worked very hard to support this aspect of the project, and the outcome was disappointing. The PDP activities finally implemented in the learner interface followed the planned activities quite closely and the re-engineered system was able to use skills audit and help and guidance data imported directly from the LUSID system.

The final system was similar in function to the LUSID system but less fully specified. In use, the consensus has been that the activities have not engaged students or staff. It was reported that learners had to be actively encouraged and supported to use the facilities and were unlikely to return of their own volition to make further use. It must be noted that this is not a unique finding and getting students and learners to use PDP effectively for reflection on their learning and development is often an uphill struggle as was shown at Liverpool Hope, for example, in their innovative attempts to embed PDP into the first year curriculum. Exploration of ways to make the activities more interactive has started and is being actively taken forward through the PDP4Life project, another pilot project in the same strand.

Engagement with IT services and interoperability

The final system was designed to be operable even with minimal direct interoperation with institutional systems. This was a decision taken to reduce the risk of the project being undeliverable. One component of the project investigated methods to bring about interoperability from a technical point of view. This was successful, and a demonstration of taking data from a SITS system to an institution’s ioAgent is available.

In practice, automatised interoperation was minimal or absent from the pilot delivery phase. In most cases registration of learners at an institution was done “by hand” and usually outside of the normal institutional processes.

Authentication and access to resources

Similarly, the risk of the Shibboleth approach to getting access to an institutions resources failing was considered unacceptably high. The Shibboleth component was hampered by the undeveloped state of the software and the lack of available expertise. Considerable progress was made by the end of the project and there is a demonstration of gaining access to an institutional resource via Shibboleth and using a Learning Matrix login.

As with registration at institutions, access to resources in the delivery phase was achieved by manually creating accounts with fresh login credentials.

Positive reactions

All the reflective reports are very positive in tone overall while noting the issues of concern described above. The feeling is that the Learning Matrix project has achieved a great deal in the short time given. Partners are interested and struck by the potential of the systems put in place, and committed at a number of levels to the idea of the HE Taster service. Reported comments from learners are positive on the whole, and most seem to have enjoyed their learning experiences. A postcode analysis of learners at Knowsley Community College shows that 88% of their learners originate from LSC uplift areas, indicating that the project has in fact reached some of its target groups.

Outcomes

In this section, assess the value of the project work. List project achievements against the aims and objectives set. Summarise project outcomes and their impact on the teaching, learning, or research communities. Indicate who will benefit from the work, how, and why. Also comment on what you learned that may be applicable to other projects, e.g. whether the methodology worked.

The major tangible outcomes of the Learning Matrix project are:

- A cohort of learners who have used the system, and undertaken some learning experience in a setting related to progression to Higher Education, providing a demonstration of the feasibility of facilitating such activity in this way
- A hardware architecture in place with a coherent set of software tools designed to support lifelong learning, together with a demonstration of its utility
- Taken together, a practical demonstration of the potential for a service to unify information about learning opportunities in the region, and support learners through transitional stages in their learning careers

Other less tangible but substantial outcomes:

- Stimulation of discussions in institutions about the issues surrounding lifelong learning scenarios and preparing the ground within IT support departments to deal with the resultant challenges
- With respect to the JISC community, a focus in the ioNode technology developments for discussions about interoperability in a practical context, and a user base benefiting from development and improvement of services

The aim of the project was “to enable non-traditional students considering progression to Higher Education to access appropriate learning opportunities from a partnership of FE/HE providers via a standards-based electronic interface” and this clearly has been achieved, as have the objectives listed in an earlier section. To some degree most of the elements in this complex whole were compromised by the need to operate in the real world of overflowing work schedules and competing interests, but where compromises have been made “placeholders” have been established as a basis for further work.

However, much of the positive benefit from the project will be lost unless ways are found to embed the work as a viable long-term service in the region. To this end, a report has been prepared (listed in appendix 1) for partners and relevant organisations in the area detailing what needs to be done to establish a Higher Education taster service delivered through the Learning Matrix technologies. A dissemination event involving all the North West regions pilot projects is planned for mid 2006 to promote take up of the work done.

Because lifelong learning, widening participation and interoperability issues are foci of a national agenda, the Learning Matrix may be of interest and value across a broad spectrum. Lifelong Learning Networks have been funded in many regions included the North West region of England, and they should find it valuable to look at the approach taken in this project. National initiatives like the AimHigher network could also find the HE Taster concept worth considering.

Conclusions

Briefly summarise any conclusions that can be drawn from the project work.

In retrospect the project appears very ambitious, even with some moderation of the original plans. However, all its various elements cohere in a way that seems necessary for progress to be made in supporting lifelong learning, and the individuals and partners involved in the project have risen to the challenges set. Despite the scale and complexity of the tasks the Learning Matrix has, in large part, achieved much of what it set out to do.

A conclusion that could be drawn from this is that the problems inherent in supporting lifelong learning are at least approachable, and that there is a value in such attempts to bring together parts separately developed into a coherent, purposeful whole.

A second conclusion would be that these integrative projects are substantial in themselves, and not merely a matter of bolting together lower level tools into larger entities. The timescales for future projects of the kind should be much longer than the 15 months available in this particular round, and allowance made for the fact that there will be development costs even if projects are built on previous work.

The third conclusion is that the idea of a Higher Education Taster service has been able to fire the enthusiasm of many people working from different perspectives. Higher Education and Further Education managers can see how this could fit into recruitment and promotional strategies, as well as taking forward agendas in widening participation. Organisations such as Connexions can see how such a service might benefit their clients. This suggests that ways should be sought to establish and embed a service into the region’s educational landscape.

Implications

Consider the future implications of your work and how others can build on it. What are the implications for other professionals in the field, for users, or for the community? What new development work could be undertaken to build on your work or carry it further?

Regional implications

The implications for the region depend on whether the project work is taken up and embedded into the educational landscape of the region. The pilot service demonstrated by the Learning Matrix project is not an exact model for any future service in the sense that:

- There was a very limited range of learning packages available, not approaching a complete view on the region's opportunities.
- There was considerable effort devoted to recruiting learners and supporting them through the processes

A viable service in the longer term will need nurturing through several stages. A document (listed in appendix 1) detailing a three year plan for the development of the service sets out the tasks that must be tackled. The resources for this further development will need to emerge from a consensus and a political will to support the service. Raising awareness of the project will be important and there have been a number of presentations about the project and its potential.

As indicated earlier, the potential of the systems put in place is not restricted to a Higher Education taster service important though that is. The systems could be used to support Lifelong Learning in other ways including credit accumulation across different institutions.

Lifelong Learning Networks

Recent initiatives by HEFCE have resulted in the establishment of fledgling Lifelong Learning Networks across the country. There are several LLNs active in the Northwest region, and some project partners are involved in these. The technologies developed and combined in the Learning Matrix project are designed to address issues of lifelong learning and are equally applicable in the context of these emerging LLNs. A joint dissemination event is being planned for The Learning Matrix and the other two regional distributed e-learning pilot projects (MANSLE and FILEPASS). This event will be targeted at regional LLN managers among other groups.

Further development

The work done in designing and implementing a Learning Matrix system based on the ioNetwork concept was taken up by other projects, notably the EELLS project in Hertfordshire. The JISC has encouraged this sharing and the Learning Matrix has benefited reciprocally. A community of interested partners has emerged and development work continues in a number of ways. The results of this work will be available for incorporation into any further refinement of the Learning Matrix.

It is clear from the project experience that the difficult task of further development of PDP activities is needed, and this development should be informed by the extensive practitioner expertise that exists, for example in the LUSID team. This task aligns closely with developments in the JISC framework where there is a close correspondence between the approach taken by the Learning Matrix and the development of a model for ePortfolio and PDP services. The feeling from the project experience is:

- PDP activities need to be more interactive to engage the learner, adding value to the data that learners input to the system
- Intelligent, personalised signposting to resources would be another area of development
- Description of learning modules normally includes an indication of the skills developed by undertaking the learning. There needs to be a mechanism for formalising these and linking them through to a learner's PDP activities.

To build on the widening participation role of the service more investigation needs to be carried out to establish how the Learning Matrix can work with other agencies such as *Connexions* and *Perceptions*. There is a great deal of potential in using the Learning Matrix to work with the specialist client groups that these and other agencies are engaged with.

References

List any references to the work of others you have cited (e.g. articles, reports, studies, standards), and any explanatory notes. Provide URLs for any materials available on the web.

[to be compiled]

Appendixes

Appendix 1 List of project documents referred to in the report

These are all available at www.thelearningmatrix.ac.uk/project

- a) “Technical expertise of IT support departments”
- b) The Learning Matrix project components and allocation of tasks
- c) The Learning Matrix: Report on Interoperability with Institutional management systems
- d) Report on using Shibboleth for authentication and authorisation with the Learning Matrix
- e) Sustainability of the Learning Matrix HE Taster service: report for partners
- f) Learning Matrix use case analysis
- g) Learning Matrix technical requirements (PDF)
- h) Plan for Student recruitment
- i) Information Required from Learning Providers and mapping to XCRI schema
- j) Report on the use of XCRI course metadata in the Learning Matrix
- k) The Learning matrix: Shibboleth report
- l) Technical description of the components of the Learning Matrix system

Appendix 2 Report on Technical development delays

Technical Development Progress, Thursday, November 24, 2005

Dr Roger Clark, Project Manager

Timetable of events

Dates	Activity	overrun	
End August	Initial final date for technical development		
End September	Date pushed back here to allow for possible slippage.		
Late September	PDP development work finished on UoL LUSID implementation ready to transfer to LMX	On time	
4 th October	Decision to abandon attempts to integrate LUSID, and replicate functionality instead. This is significant unanticipated extra work		
6 th October	Roger and Anthony complete acceptance testing at Exeter, but without LUSID integration	1 week	
11 th & 14 th October	Training events with Connexions and other staff. A number of issues emerged which significantly compromised functionality. These were not apparent in the testing previously, but were mostly related to multiple simultaneous users and to workflow aberrations.		
28 th October	Version 1.1 released including new PDP services and fixes of problems	4 weeks	
8 th November	Start of trial with St Helen's students. Further issues emerged and were promptly tackled by Phosphorix		
25 th November	The now stabilized software installed, and servers moved to Plymouth remote facility.		
28 th November	Separate ioAgents available to each institution for publishing courses and managing students	8 weeks	

Perspective

- Considerable effort was taken with trying to incorporate LUSID, which should have been straightforward. The problem encountered was random generation of completely blank web pages. When no progress seemed possible we agreed a second plan with Phosphorix, which involved re-engineering the functionality in a completely different technology, and the project manager worked closely with their developer to implement this quickly. Marie Connor from the UoL LUSID team was very helpful and Phosphorix turned this further extra work around very quickly.
- Whereas the original plan was to use the system and then feed back to adjustments and improvements, we have short-circuited this with a feed-back and improvement cycle before full roll-out. This means we have a more stable and complete system for most of the learners and tutors.
- The combination of these has delayed the main recruitment phase, but has not jeopardised the project overall because we are able to absorb this. To offset the delay, we have a system which is in a more advanced stage of development than we could have expected.
- The new PDP facility does not fully replicate the original plan, and in particular students will not be able to email parts of the PDP to a tutor. This means that learner-tutor sessions which would have focused on this shared information will have to be managed differently unless the email functions can be added.

- It has to be remembered that this is sophisticated, state of the art technology. We have produced a system with a great deal of functionality within a short timescale, thanks to our clarity of purpose and the support of our developers, Phosphorix.

Appendix 3 Statistics on Learning Packages and Learners

Provider	Learning Package	Total student numbers		recruit nos *	source of recruits **	
		enrolled	completed		internal	outside
Edge Hill				0		
	Childhood studies	0	0		0	0
	Developing academic study skills	0	0		0	0
	Marketing	0	0		0	0
Liverpool Hope University				4		
	Can you keep safe in the Internet Jungle?	4	3		0	4
Liverpool John Moores University				12		
	City life	0	0		0	0
	Etching (Intaglio Printmaking)	12	7		0	12
Knowsley Community College				7		
	Manipulating images with Photoshop	7	7		7	0
St Helens College				20		
	Early years – Nature or Nurture? You decide	2	2		0	2
	Maths for engineering	14	14		14	0
	Photographic ‘Digital’ Bridging Module	4	4		3	1
West Cheshire College				11		
	Opportunities in the construction industry	3	3		0	3
	Health & social care	0	0		0	0
	Preparing yourself for success	8	6		8	0
totals		54	46	54	25	22

* The number of learners recruited by the institution

** Internal means recruited as current students from the same institution that delivered the package, external refers to learners taking a package at an institution where they are not existing students.