

JISC DEVELOPMENT PROGRAMMES

Project Document Cover Sheet

PROJECT REPORT

Project

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e-Portfolio Reference Model September 2006 Report

**JISC Distributed eLearning Programme:
eLearning e-Framework Reference Models**

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- A continuing dialogue with Amanda Black and Stuart Jones of Becta, which has helped Higher Education colleagues develop a better understanding of the school and college perspective required to build lifelong learning across sectors.

The project built upon:

- the concept of e-Portfolio as an application rather than a service within the e-Framework, proposed by Scott Wilson;
- the work of Simon Grant in providing the vocabularies for Personal Development Planning
- the scenarios and use cases for transition to college and from college and university into employment developed by staff at Nottingham Trent University for the RIPPLL DeL Regional Pilot project
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- The experience of e-Portfolio technology developed by Nuventive and Phosphorix as a basis for the Personal Profiling Service Prototype

The team also thanks the JISC-CETIS Portfolio SIG for providing opportunities for consultation on 28 April and 9 June 2006.²

¹ The *Scoping and Evaluating e-Portfolio* report for Becta is expected to be published shortly.

² Opportunities for earlier consultation had been requested.

1 Executive Summary

e-Portfolio for lifelong learning is desirable, but is it feasible?

Key finding: This project has shown that the e-Framework can reduce the complex challenge of e-Portfolio for lifelong learning to simpler terms, in which it becomes both doable and affordable, and can be implemented and sustained.

Key outputs: This project has produced:

- An overarching domain map, comprising service flows and web services covering the whole process of transition into HE through UCAS, predicated on an e-Portfolio-based learner application
- Technical specifications:
 - Service genre – Personal Profiling service
 - Use cases and Service Definitions scoping further service genres.
- A demonstrator illustrating services for HE admissions interacting with an e-Portfolio system
- Prototypes of two web services: *Get Entry Profile* service and *Get e-Portfolio Items* service
- An exemplification of the ‘thin’ model of e-Portfolio designed for the more open information environments JISC is developing and covering implementations within a single institution and for Lifelong Learning and Lifewide Learning
- A substantial technological foundation for the September 2006 JISC ITT for HE community projects on admissions beginning in March 2007.
- A commitment from the University of Nottingham to build on this work within the institution for staff (e.g. piloting e-Portfolio for CPD), for students (e-Portfolio for Integrative Learning, including placement learning, through the CETL and in liaison with employers) and within the region, in partnership with the Derbyshire-Nottinghamshire LLN and further JISC projects.

Aims and Objectives

The project was reviewed by three sets of external consultants contracted to DfES and Becta. Partly as a result of this and working within a knowledge architecture agreed through DfES, Becta are now developing policy in relation to four broad categories of e-Portfolio: Learning e-Portfolio, Assessment e-Portfolio, Presentation e-Portfolio and Transition e-Portfolio.

The overarching aim of this project was to focus on mapping and specifying services for Transition e-Portfolio, a function uniting learning with administrative processes, in relation to the e-Framework, in order to stimulate and facilitate an implementation of e-Portfolio which would be both incremental and on a large scale.

The project thus aimed to conceptualise e-Portfolio in terms of the e-Framework; to review the role of standards, seeking a simpler, more pragmatic model of interoperability than that of IMS LIP; to focus on two major learner transitions; and, as part of the learning process, to provide for continuing access to learner-generated data (e.g. the UCAS Personal Statement), alongside administrative records, before, through and after transitions.

Overall approach: Thin model of e-Portfolio

The project developed the concept of the ‘thin’ e-Portfolio: (i) in relation to two practical implementation contexts (transition from Key Stage 4 to FE and from FE to HE via UCAS) and also (ii) in dialogue with key stakeholders, including UCAS, DfES, Becta and BSI. Scenario-building workshops were used to identify and prioritise e-Portfolio-enabled web services within the e-Framework. This practitioner-based work informed the development of use cases, which provided the basis for the development of a demonstration and two prototypes of web services for HE admissions.

Further findings and Conclusions

Re-usable technology This project demonstrated that the ICT developed for transitions at one point in an education pathway can be re-used at another. It also shows that web services developed for summative assessment within administrative admissions processes can be adapted for formative learning, transforming learners’ experience of transition. This proof of reusability has significant implications for sustainability.

Practical IT standards A number of JISC projects have demonstrated that the existing IMS specification for learner information can be made to work, but that it is over-complex. This project has shown how the e-Framework provides a means of making current monolithic specifications more fit for purpose and has broken them down into the application profiles required to pass data between an e-

Portfolio and e-Portfolio enabled services. By aggregating such proven application profiles, it will be possible to develop and pilot new, more practicable specifications for learner information and related domains and report them back to international standards bodies, such as IMS and ISO.

Thin model of e-Portfolio The open structure of the thin model allows services to be prioritised and implemented incrementally. It provides great flexibility both to institutions and to government, enabling them to respond quickly to changing demands. Evaluations commissioned by DfES and Becta broadly endorse the project's business and technical approach. The model takes account of repositories, but questions whether it is appropriate to add complexity to its implementation by requiring extensive, formal metadata.

Exemplifying the e-Framework The project has exemplified to strategic stakeholders the wider potential of the e-Framework to reduce a complex problem to simpler terms in which implementation becomes practicable. Future work by Becta and work proposed in Germany on *Schlanke* (thin) e-Portfolio will build upon this Reference Model, in both cases committing to a wider engagement with the e-Framework.

Maturity of Transition e-Portfolio Focusing on Transition e-Portfolio, this project contributed to the discussion behind the 3Square report of April 2006, helping to establish that this is the most mature of the four Becta categories and should therefore be the first for implementation.

Implications for e-Administration Some practitioner communities, such as the PDP community, are already closely engaged with e-Portfolio technology. However, further important communities for key services are not yet engaged. These include school and college advisors and administrative staff. While this project argues strongly for a full understanding of the impact of Transition e-Portfolio on learning, the project **recommends** the development of further Reference Models of e-Portfolio services to engage communities beyond PDP.

Integrative e-Portfolio This project highlights the need to maximise the potential of e-Portfolio technology by moving from definitions of PDP that were developed in the 1990s for paper Progress Files towards a pedagogy of integrative learning.

1.1 e-Portfolio Terminology

e-Portfolio: e-Portfolio is envisaged as an engine for personal learning space, an application which supports the different sub-processes which a learner requires in order to complete a transition process. This concept is discussed and illustrated fully in Annex 4, 'Defining an e-Portfolio engine for personal learning space'. Cf. the definition of 'e-Portfolio Application', provided in the table below.

The following conventions are used in this report:

e-Portfolio enabled service	Services and candidate services in the e-Framework which make use of an e-Portfolio Application
e-Portfolio Item	An item of information which is a single entity within an e-Portfolio repository or service
e-Portfolio Application	The application which passes data between repositories and e-Portfolio enabled services held within one of <ul style="list-style-type: none"> • a single system • several discrete systems that may be linked together • several discrete systems available on the web with no formal links
Transition e-Portfolio	An e-Portfolio system which is focused towards one of the four broad categories of e-Portfolio currently proposed to Becta in the UK. (The other three are: <ul style="list-style-type: none"> • Assessment e-Portfolio • Presentation e-Portfolio • Learning e-Portfolio)
e-Progress File	The electronic version of the paper Progress File developed for UK school, college and university students to complete as a record of their formal and informal achievement (mandatory in Higher Education)
Personal Development Planning (PDP)	A form of practice developed in UK schools, colleges and universities (mandatory in Higher Education): a structured and supported process undertaken by individuals to reflect upon their own learning, and/or achievement, set challenging but realistic goals and plan for their personal, educational and career development

2 Background

2.1 1998–2002 PDP, e-Progress File, e-Portfolio

The beginnings of current work on e-Portfolio can be traced back to pilot projects on records of achievement and personal development planning (PDP), supported by the UK Ministry of Education from 1984 onwards. The Dearing Reports into education from age 16 to 19 (1996)³ and into higher education (1997)⁴ led to a sequence of related initiatives associated with a new name, Progress Files. In 1998 the Ministry sponsored six university projects involving the use of ICT to explore ways of encouraging students to reflect on and record their development.⁵

Since then, JISC has made a sustained investment in technology to allow the personal profile that a learner has developed in one episode of learning to be made available in the next. From 2002 JISC ran a major Lifelong Learning Programme encompassing schools, colleges, universities, trade unions and employers. One of the projects in this programme, *Specifying an ePortfolio*⁶, included a pilot in which learner information within the Nottingham schools' Passport system was transferred to a different ICT system in the University of Nottingham, using the interoperability specification IMS LIP and its UK Specialisation, UK LeaP⁷.

Because of JISC's investment, some institutions involved in the projects of 1998 are now in a position to begin building continuing records of lifelong learning. The new possibilities opened out by the technology have led to the term 'e-Portfolio' replacing 'progress file' to describe the emerging new generation of practice which it enables.

It is important that old definitions of PDP (primarily predicated on the individual and the use of paper-based practice) are revised to take account of new technical developments which offer the possibility of transforming the experience of learning. Given the spontaneous and enthusiastic take-up of leading-edge social, collaborative and mobile technologies by young people, the survival of current PDP programmes depends on their readiness and ability to embrace these technologies.

2.2 2003–2005 Transition e-Portfolio – the developing rationale

Only one of the 1998 DfEE-funded projects led to a full institution-wide implementation of an electronic Progress File in HE – the Newcastle-Nottingham Internet-PARs Project⁸, which paved the way for the development and implementation of ePARs⁹ across the University of Nottingham, an e-Portfolio initiative led by Angela Smallwood.¹⁰ By 2003 a shared vision of reflective PDP which closely matched the concept of e-Portfolio had been developed across schools, colleges and universities in the UK East Midlands. The original diagram for the JISC-funded *Specifying an e-Portfolio* project (figure 1) proposed the work required to demonstrate the technical feasibility of passing e-Portfolio information from one episode of learning to the next, to support widening participation and lifelong learning. The heart of the project lay in moving enhanced personal information between institutions and UCAS, to support flexibility in admissions processes and transitions into HE, using UK LeaP to achieve interoperability between discrete ICT systems.

³Dearing, Sir Ron. (March 1996) Review of Qualifications for 16-19 Year Olds. School Curriculum and Assessment Authority. SCAA.

⁴<http://www.leeds.ac.uk/educol/ncihe/>

⁵ See the section on 'recording achievement' on <http://www.dfes.gov.uk/dfee/hege/publication.htm>

⁶ See <http://www.nottingham.ac.uk/eportfolio/specifyinganepportfolio/index.htm>

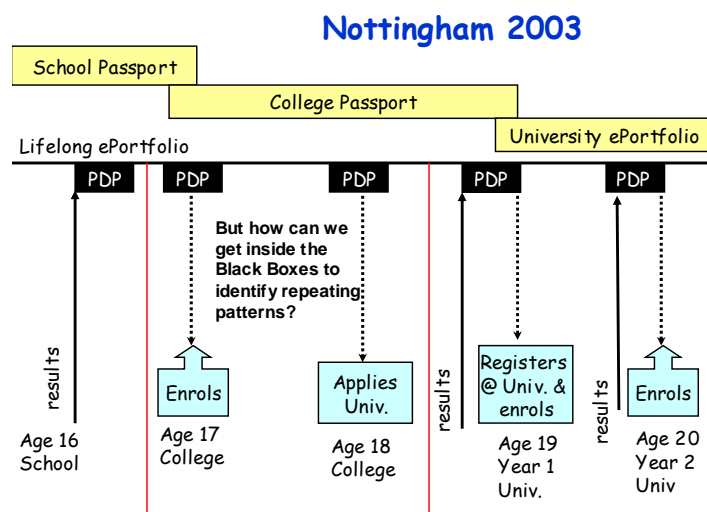
⁷ Following advice from CETIS that pilots suggested more work was required prior to publication as a standard, BSI have Published UK LeaP as a Draft for Development, DD 8788-3:2006 UK lifelong learner information profile (UKLeaP), see <http://www.bsi-global.com/ICT/Elearning/DD8788-3.xalter>

⁸ Executive summary at <http://www.internet-pars.ac.uk/exec?view=context%20>

⁹ See <http://www.nottingham.ac.uk/padshe/ePARs/IntroPage.htm>

¹⁰ e-Portfolio or Progress File based practice has also become mandatory/common in some professional areas such as Nursing and Medicine and is ubiquitous in some subject areas, such as Geography

Figure 1



The need to make choices and complete transitions between institutions successfully was the key rationale and motivation for learners to use e-Portfolio from age 14 onwards. The importance of UCAS as a project partner lay in its key role as custodian of the national transition process for school and college learners applying for places in UK HE. *Specifying an e-Portfolio* stressed the integral relationship of learners' presentational e-Portfolios, assembled for application to HE, with their ongoing educational development, as represented in the learning e-Portfolios which learners would use both during pre-HE studies and after entry to HE. The project proposed that the presentational UCAS application would reference material in the prior learning e-Portfolio and also provide data to carry into the learning e-Portfolio developed subsequently through undergraduate study.

The initial findings of the Specifying an e-Portfolio Project led to the framing of this proposition in June 2004:

The Scenarios of Practice developed by the University of Nottingham suggest that both PDP and the processes by which learners apply for work and education at different levels of attainment exhibit common patterns of behaviour and process such that the ICT developed to support practice at one level should be re-useable at another. If this is the case, the complexity and cost of implementing e-portfolios for Lifelong Learning will be significantly reduced and the practicability of achieving interoperability will be increased.

'Proposition 1'

Colleagues in the Cabinet Office and the English Ministry of Education, DfES, were members of the Steering Group for the project and in March 2005 Peter Rees Jones was commissioned to provide a report on the capacity of e-Portfolio to deliver key aspects of the recently published national eLearning Strategy. This set out the agenda that the initial phase of the e-Portfolio Reference Model project has followed.

The potential benefits of the successful implementation of e-Portfolio are clear:

The definition of e-Portfolio should take account of the active services and tools that a learner uses in conjunction with his or her e-Portfolio to review and plan development, acquire new abilities throughout life and present achievement.

By developing the capability of a learner at any level of attainment to take increasing control of his or her own learning and achieve challenging but realistic goals, the opportunities open to a learner will increase and the need of a modern economy for a highly skilled and flexible workforce will be met.

If learners from certain groups are less likely to acquire these capabilities informally, a formal policy for Lifelong Learning may be expected to impact on these groups especially and to promote social inclusion and enhance social mobility.

'Proposition 2'

However, the lists of detailed requirements developed by practitioners have proved to be increasingly long and complex. The key issue for the e-Portfolio Reference Model project was, therefore, whether a

practical proposal for e-Portfolio for lifelong learning could be developed which would be feasible to implement in the short to medium term.

During the lifetime of the project, the urgency of this issue intensified as e-Portfolio continued to move up the political agenda in the UK.

'...this is a really important point; we will have to re-engineer the data so that wherever you are in the education system the individual learner can demonstrate to another institution, an employer, or to a parent, what they have done, how they are succeeding and who they are.'

Michael Stevenson head of DfES Technical Group January 2006

'e-portfolios...are personal online spaces for students to access services and store work. They will become ever more useful as learners grow up and start moving between different types of learning and different institutions.'

Ruth Kelly Secretary of State for Education, January 2006¹¹

At the time of writing this report, the DfES is developing a programme to deliver a strategic learner-centred architecture that enables personalised online support, tailored to individual needs but integrated across different services and providers, which follows the learner over time and allows the individual (and other people, such as a parent or employer) to gain an integrated view of that person's development. It is proposed that the resulting learning space, which should be available to all school and college students from 2008, should be capable of supporting e-Portfolio.

A specific policy context for the implementation of Transition e-Portfolio is provided by the Schwartz and Wilson reviews of HE admissions, which have made recommendations for the use of e-Portfolio in a reformed admissions process.

In 2004, the Schwartz report¹² noted that:

'The JISC [*Specifying an e-portfolio project*] ... aims to make information and evidence available in an accessible electronic form that can be customised to support the admissions process and give feedback to the applicant. The project is specifically examining the potential of entry criteria and course information to structure the personal statement. This would allow academic staff to set prompts for their own courses. UCAS and other admissions services should also consider the inclusion of additional information to produce a fuller transcript of applicants' achievement. A more informative application ... may in itself reduce the need for additional testing'¹³

In September 2005, Sir Alan Wilson undertook a further review¹⁴:

'There is also much work going on in the sector in relation to the development of e-portfolios, the content of which could include a portfolio of evidence compiled by the student, a developmental CV and a transcript or learner record. This includes work by UCAS and the [JISC] in the area of e-portfolios and online applications, and also development through the British Standards Institution of the technical standard UKLeaP, based on international standards, to support transfer of learner information. Additionally there are links into Europe and the Europass learner record. This type of information, representing an up-to-date collection of a student's achievement, could be used by HEIs to help inform admissions decisions. It could be a particularly useful record for those students not following the traditional A-level or Higher based route into HE.'

3 Aims and Objectives

3.1 Stimulating large-scale Implementation

In the *Scoping and Evaluating e-Portfolios* draft report for Becta (March 2006), 3Square Solutions Ltd note that learning e-Portfolios require careful small-scale development but that a number of other benefits of e-Portfolio implementation are essentially administrative and require larger-scale implementation to achieve business benefit. Evidence suggests that successful progress in this area will inform and promote developments in technology to support transformational e-Learning.

¹¹ See http://www.tes.co.uk/search/story/?story_id=2166552

¹² The report is available from <http://www.admissions-review.org.uk/>

¹³ p. 47; E9

¹⁴ Sir Alan Wilson, Improving the Higher Education Applications Process, a consultation paper 05 09 09 <http://image.guardian.co.uk/sys-files/Education/documents/2005/09/09/ImprovingHE.pdf>

This objective is the rationale of the Reference Model's focus on Transition e-Portfolio, initially applied to school to college transitions and then, from September 2005, FE to HE transitions. The specific aim of this work has been to provide the basis of a phased implementation of electronic data interchange (EDI), contributing to the development of truly personalised opportunities by ensuring that work is broad-reaching through piloting a range of transitions, as proposed by 3Square, including through agencies such as Connexions.

3.2 Reviewing the role of standards

A second key project objective has been to review the role of standards. This strong, pragmatic emphasis on implementation requires that technical standards are rationalised in order to provide a clear roadmap for delivery¹⁵. Members of the project team have played a key role in the development of standards. Pilots of these standards by the team, in contexts which lie outside the project, confirm that they are not capable of delivering a business case for Transition e-Portfolio. We believe that this problem arises from the **theoretical** approach taken by the IMS LIP and IMS e-Portfolio specifications. This cannot be resolved by producing further versions of these specifications using the same approach, such as UK LeaP.¹⁶ What is required is a new, **pragmatic** approach in which application profiles of existing specifications are implemented and, where successful, simplified version specifications, designed for effective implementation, are produced.

3.3 Reviewing e-Portfolio in terms of the e-Framework

A third key objective has been to review how the e-Framework can reduce the complex problem of e-Portfolio to the simpler terms in which it becomes capable of implementation. Section 7.2 scopes the narrow interfaces required to pass data between the different services making up processes such as Application to HE, or the development by a student of an Individual Learning Plan. This can make effective use of sections of existing IMS specifications, but not their prolix structures. The e-Framework provides a structure within which these *application profiles* of IMS specifications could pass data from one service to another.

3.4 Including Personalised Learner Information

A fourth key objective has been to ensure that information exchanges included not just information about the learner held by an institution, but also personalised information that learners had developed about themselves. The project has therefore paid close attention to the Personal Statement within the HE admissions process, how colleges help learners to develop this information and how this information can be used by HE advisors to support induction.

3.5 Articulating the links between Transition e-Portfolio and Learning

The project has identified the learning processes within sending and receiving institutions that support learners to succeed in completing transition and induction. These learning flows are of significant interest for future Learning e-Portfolio projects. This report recommends that further Reference Models should be developed for the Learning Services making use of e-Portfolio.

3.6 Involving UCAS and engaging with HE admissions issues

It was not until September 2005 that it became apparent that UCAS would become a partner in the project. The initial project plan envisaged that the key focal points would be the transitions from KS4 to FE and from undergraduate to postgraduate study. However, from September 2005, transition into HE replaced the second of these.

¹⁵ 3Square broadly endorse the need for rationalisation

¹⁶ UK lifelong learner information profile (UKLeaP), Representation and terminology in implementing the UK Lifelong Learner Information Profile. Specification DD 8788-3:2006, available through <http://www.bsi-global.com/ICT/Elearning/DD8788-3.xalter>

Figure 2 The Original Bid without UCAS:

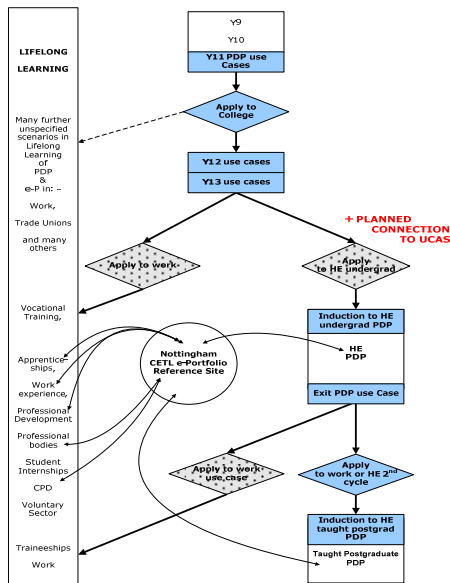
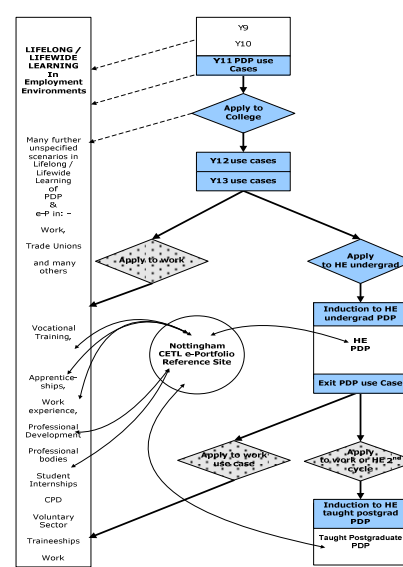


Figure 3 With UCAS involvement



4 Project methodology and implementation

4.1 Background

Our approach was to test and develop the concept of the 'thin' e-Portfolio, suggested by Scott Wilson of JISC-CETIS, in relation to a range of practical implementation contexts within and beyond the expertise of the Nottingham team. We expected to draw upon 14-19 and HE e-Portfolio work carried out within the Nottingham consortium and to invest significantly in scenarios of practice developed collaboratively with other project teams.

However, six months in, after UCAS joined the project, the emphasis shifted away from broadening the practice base of the project and towards dialogue with other key stakeholders (DfES, Becta, UCISA-CISG, BSI, JISC-CETIS Portfolio SIG and UK CETLS working with e-Portfolio), a move which led to the significant impact which the project has had on the thinking of policy makers nationally.

4.2 Methodology

We adopted the *Building Scenarios* methodology developed by Peter Rees Jones for the JISC MLEs for Lifelong Learning programme and piloted by *Specifying an e-Portfolio*¹⁷. The key questions it poses are not about current practice or current 'user needs' in any routine sense, but about the best of current practice, brought together with what experienced, innovative practitioners might 'intend' achievable good practice to look like, supported by the latest technology, in five and ten years' time, further contextualised by an understanding of the conflicts between different stakeholders' interests.

We began by commissioning use cases relating to a range of non-traditional learners from Ufl/learnirect, and later drew in the experience of Queensland University of Technology in Australia for work on transition from study to employment. A number of workshops were run for invited participants, representing teachers, admissions tutors, admissions officers, IS staff and careers staff in institutions, as well as local authority strategic groups, training providers, and information advice and guidance staff. Through the course of the project, the scenario-building materials have been modified and new workshop exercises are being drafted to support practitioners in identifying and prioritising e-Portfolio-enabled web services within the e-Framework.

The project also reviewed parallel established practice in other domains, in particular established HR practice such as job and person specifications, which formed the basis of the Personal Profiling Service.

¹⁷ See materials at <http://www.nottingham.ac.uk/rippl/keydocuments/RequirementsResourcePack.doc> and <http://www.nottingham.ac.uk/rippl/keydocuments/ResourcePackAnnexV3.doc>

By providing a large number of drafts, discussion papers and seminar and conference presentations for iterative discussion within the team and with the strategic groups already mentioned, Peter Rees Jones developed a series of illustrations of thin e-Portfolio, in the form of domain maps of flows of services for lifelong learning transitions¹⁸. These exemplifications of processes also provided the stimuli for consensus-building among both policy-makers and technical/pedagogic leaders. Future pilots will verify these maps and elaborate them in the ways required by particular communities of practice.

4.3 Technical

In Spring 2005, at the start of the project, Peter Rees Jones was commissioned by DfES to provide recommendations for the development of the Department's work for e-Portfolio. The report included a set of propositions that could be verified: for example Propositions 1 and 2 cited earlier in this report.

The key technical proposition of the project is that e-Framework services can express the use of e-Portfolio in simple terms, for example by providing the set of discrete interfaces required by each of the services making use of e-Portfolio, rather than attempting to express all potential uses of e-Portfolio in a single monolithic specification. This underlies Proposition 1 in this report.

The scenarios of practice provided by practitioners informed the development of use cases, which were expressed in TQI notation, for example for the Personal Profiling Service in Annex 2, Diagram 1. This is intended as a basis for elaboration into a variety of service expressions by future projects¹⁹. This also provided a basis for the development of a demonstration and two prototypes of web services.

4.4 Consolidation

The work of the project has come to centre on the UCAS process, although it was originally intended to take account of a wider range of practice first explored by JISC DeL projects and now being developed by JISC regional and HEFCE LLN projects.

Beyond the project, Peter Rees Jones has re-factored the service flows required by the UCAS process to take account of the distinctive needs of regional partnerships. He is currently reconfiguring the original templates by which projects can develop scenarios of practice and use cases to take specific account of the e-Framework, drawing on the experience of project workshops. This will provide materials suitable for Learning, Assessment and Presentation e-Portfolios and international audiences in an e-Portfolio Development Workshop pack available in late 2006.

This work is identifying the types of data required by service interfaces and will form the basis for the specification of lightweight profiles of these interfaces which could be mapped to other initiatives, such as the MIAP mappings of data flows. Following successful pilots and adoption, these could form the basis of *de facto* and formal standards.

5 Outcomes and Results (A): Transition e-Portfolio maps as a basis for development and demonstration by Projects

5.1 The Problem

By 2005 a broad consensus had been achieved within the UK about the potential benefits of e-Portfolio both for learners and for meeting key policy objectives such as personalised and lifelong learning.

However, there were serious questions about the feasibility of e-Portfolio. By 2005 there were lengthening, undifferentiated lists of user requirements, competing stakeholder agendas, disconnected e-Portfolio initiatives for Personal Development and Assessment, and a theoretical debate about the specifications required for lifelong learning which focused on categorising data, while there was relatively little focus upon the processes generating and using data in order to achieve implementations.

In 2005 e-Portfolio was seen as desirable but was it feasible?

The Reference Model has focused on how the e-Framework can reduce this apparently complex problem to the simpler terms in which it can be implemented by focusing on key processes representing quick wins with high impact.

¹⁸ See <http://www.nottingham.ac.uk/epreferencemodel/outputs.htm>

¹⁹ We felt that the UML specification did not offer a useful means of mapping service flows in a form that could be understood by non-technical stakeholders. (Balbir Barn of the COVARM Reference Model is in discussions with JISC to propose how BPMN [Business Process Modelling Notation] might be used by projects to provide formal and accessible diagrams.)

The Reference Model took a highly pragmatic approach by focusing on Transition e-Portfolio, where there are strong business cases for implementation. However, it has located the point of transition within the context both of the learning that prepares the student in the sending institution, and the induction process that introduces the new student to learning in the receiving institution. It sees the potential of e-Portfolio to transform transition – which has often been seen simply as an administrative process – by making clear to students how their experience of transition both draws upon and contributes to their learning, forming part of their learning e-Portfolio and their on-going career development throughout life.

5.2 Application to HE: The Overarching Service Flow Scenario

This overarching scenario illustrates how the different materials for the different stages of the admissions service-flow link to one another. Some stages are well scoped, others are in development and others are available in outline ready to be developed in more detail. Gaps remaining to be addressed are also identified.

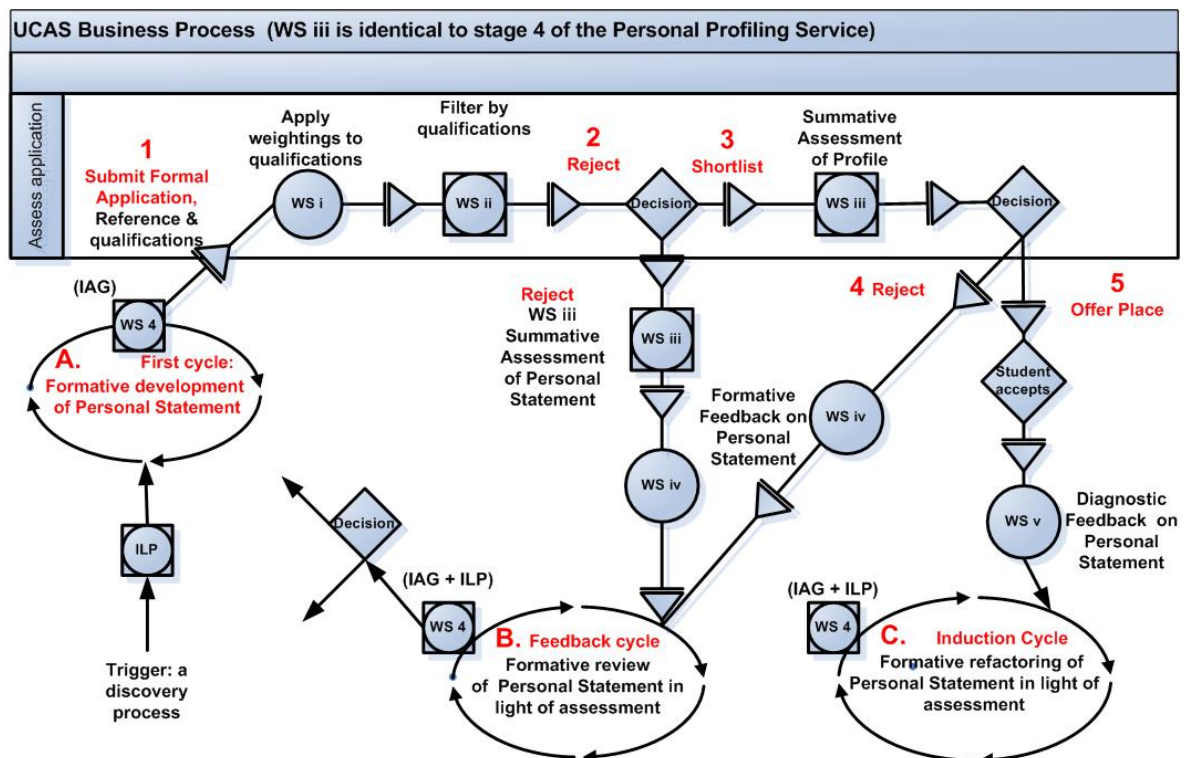


Figure 4

5.2.1 The Scenario

Background: A. First Cycle Soon after entering college at age 17, a learner has negotiated an Individual Learning Plan (ILP) with her advisor. She has used her Learning e-Portfolio to help set herself realistic but challenging goals, negotiate a plan and monitor her progress. Application to Higher Education is an important theme throughout the plan.

5.2.1.1 Preparing to apply to HE: Aged 18, early in her second term at college, she receives some results from a diagnostic assessment and prepares to meet her advisor to negotiate an extension to her ILP. She reviews her performance using her Learning e-Portfolio, provides her advisor with material for the meeting and negotiates the new ILP.

Gap: learners' valuable informal use of collaborative technologies, such as MSN, to seek informal advice beyond the formal process of education from friends/family.

Following actions: The Learner carries through her plan.

5.2.1.2 Making trial Applications for Formative Assessment: One part of the plan is for the student to map herself against the entry requirements of different courses by drafting some trial applications to HE. She then discusses her adviser's assessment of these.²⁰

5.2.1.3 Making an Application to HE for Summative Assessment: The learner and referee are assisted by web services operating within an *Admissions Service* to complete a structured Personal Statement and a Reference.

Gap: the web services required by admissions staff to assess applications.

5.2.1.4. Feedback to all:

(A) The applicant is rejected: Here there is a risk that failure to gain a place may cause the learner to disengage. Formative feedback enables the applicant to learn from the experience and identify appropriate future opportunities.

(B) The applicant is accepted: Induction to HE The summative assessment of the application may reveal strengths to build on and/or significant issues that the learner needs to address.

5.2.1.5 Feedback for Institutions: By aggregating the results of feedback to individuals, colleges may gain a better understanding of how their internal e-Portfolio-enabled processes may be enhanced.

Could this same broad pattern of process apply to a parallel application to employment at the same time as admission to HE? Could the same broad pattern also apply to applications for both a postgraduate course and employment? If so, the same generic technology could be adapted and elaborated to meet all these needs, reducing the complexity and cost of implementation. By looking at the process, patterns which are not immediately obvious within the data become apparent.

5.2.2 Guide to the Annexes on Application for Transition

The e-Portfolio Reference Model provides a set of domain maps of the services supporting application to opportunities in education or employment. The services are derived from current practice, especially current practice in employment that may be used within reformed HE application processes. The maps are intended as a basis for projects which will refine, develop and propose services for formal submission to the e-Framework.

Annexes 2-3 focus on the UK HE admissions process. The underlying patterns within the process are similar to other application processes: for example many UK students use the pattern described in the Personal Profiling Service (Annex 2) to develop applications to employment²¹.

These maps suggested a thin architecture for e-Portfolio in which an engine provides information for services to consume and passes back information to repositories (Annex 4). The specifications and service definitions in Annex 5 form the basis for the demonstration and prototypes of the Personal Profiling Service of Annex 2 and act as a model and basis for future work.

The thin model could be implemented within an e-Portfolio system but is intended to take advantage of the opportunities and economies that Web 2.0 is opening out. There are an increasing number of regional partnerships supporting lifelong learning: the draft paper *e-Portfolio for Development: Implementation by Regional Partnerships* (www.nottingham.ac.uk/epreferencemodel/keydocuments/THINePregionV2bc.pdf) discusses how they might benefit by moving from discrete e-Portfolio systems and the practicability of this approach.

5.2.3 Transforming Learners' experience of transition

A recurrent theme within this scenario is the formative and summative assessment of Transition e-Portfolio (diagnostic assessment is also likely to be important). A fundamental objective of work on Assessment e-Portfolio is to reduce the burden of assessment and to make the value of the assessment to learning obvious to the learner. In this way the learner's experience of learning is transformed.

In other words, the transformation of learning results from the integration of different kinds of service (assessment and learning), which are currently seen as two separate domains.

²⁰ The e-Portfolio Development Workshop pack available in late 2006 will provide outline maps of the services scoped by the Personal Profiling Service: Personal Planning; Advice and Guidance and Feedback

²¹ The workshop Exercise in the e-Portfolio Workshop Development Pack will re-factor the Personal Profiling Service for application to employment and ask how the Personal Planning; Advice and Guidance and Feedback need to be re-factored for employment.

Superficially, an admission/application service may appear to the applicant as no more than an administrative process. If the learning implicit in the process is made explicit, the students' experience of the process is transformed, enabling them to apply what they have learned to future applications to education and employment.

It is interesting that the formative web services for preparing applicants in a college are elaborations of the same basic web services required by the administrative process of application. This suggests that the re-use of web services across existing silos may be connected to the transformation of existing assessment, transition and learning. On a more basic level, this can be expected to reduce the cost of developing Learning e-Portfolio services and enable the business case for learning to be tightly coupled to the business case for ICT services, at low marginal cost.

The Application to HE Scenario developed suggests that web services developed for one type of service (e.g. summative assessment in an administrative context) may be re-used for another (e.g. formative assessment in a learning context). This has the potential to transform a student's experience of learning in all aspects of life by identifying the value of learning beyond formal education.

On a technical level the elaboration of a bare web service for use in many contexts has important implications for the cost effective development of ICT tailored to individuals' needs and preferences and as a basis for the incremental development of de facto and formal standards.

'Proposition 3'

6 Outcomes and Results (B): The e-Framework as enabling technology – a viable approach to specifying the e-Portfolio domain

There is a need for technical specifications to support the exchange of learner information between episodes of learning in education and employment. This has proved difficult to achieve for e-Portfolio, since practice in this field is immature and a full specification must therefore guess at what mature e-Portfolio practice will require. This is an insecure foundation for useful work.

This problem is compounded because current IMS specifications are over-long and over-complex. They concentrate upon data, without taking adequate account of the processes making use of it.

6.1 Developing a solution

6.1.1 The Reference Model

Rather than providing a solution, the Reference Model proposes a means by which a solution may be developed through the progressive implementation of processes which are potential quick wins with high impact.

The Reference Model uses the e-Framework to propose a set of services using e-Portfolio which can be formed into sequences mapping particular processes. In particular the Reference Model provides an outline of processes involving Transition e-Portfolio²² as a starting point and stimulus for the creation of a broader map covering other processes, which successor projects can develop and prove through pilot implementations. Section 5 notes the strong links with Assessment and Learning. Transition e-Portfolio therefore represents a starting point for the progressive specification of the whole domain in terms of processes, using the e-Framework.

This approach does not discard existing IMS specifications or UK LeaP; it does, however, require them to be radically reconfigured. IMS specifications have tended to increase the complexity of the problem they represent: by profiling them in terms of processes, we can break down e-Portfolio into a set of simpler discrete interfaces and discard the unnecessary apparatus of a monolithic specification.

The Reference Model project has provided bare materials exemplifying the approach that projects could develop and demonstrate:

²² However, as section 5 implies, mapping the transition requires the mapping of the processes which lead up to the transition and follow it. By mapping transitions we also begin to map key Learning e-Portfolio services.

- An abstract model of the service flow of an Individual Learning Plan, as the basis for the development of a more specific model of an ILP supporting a college student prepare for HE entry (outlined in Annex 4 *ILP Use Case Diagram*, see also 7.2 below)
- The set of services supporting the development of the ILP, each of which might be developed as a Reference Model in its own right. (The JISC-funded XCRI project on exchanging course-related information is already developing a Reference Model of the *Pathway Information Service* within the flow.)
- Drilling into a service, a set of bare web services providing a demonstration of the Structured Personal Statement and a starting point for elaboration by other developers (Annex 5)

The high level service flow in 5.2.1 *encapsulates* (ignores) the types of data passing between the e-Portfolio and the *services* making use of it. In the more detailed flow of web services within an *Applications/Admissions Service* in Annex 2 the data types are still not explicit, but clearly match the UK-specific vocabularies that Simon Grant of JISC-CETIS developed for UK Leap.

The next phase of work should identify the data types within interfaces explicitly. This will outline a set of minimal application profiles. Taken together, such low-level application profiles form an outline of the application profile required for an overarching *Personal Statement Service*, which might form a part of a wider *Admissions/Applications Service*.

Transition e-Portfolio will be implemented within existing data flows which are being mapped through the MIAP project and by Becta; this will also be true of other types of e-Portfolio.

Recommendation: specific account should be taken of the MIAP and Becta work on data flows and common conventions should be used to ensure that JISC can draw upon and contribute to this work, for example for the representation of workflow and the attributes of data items. This is relevant to both e-Portfolio and e-Administration and it is clear that many flows cross between these domains.

6.1.2 IMS specifications

Past IMS specifications attempted to provide maps of large domains such as Learner Information. The Reference Model proposes an approach which takes just those chunks of the specification relevant to a particular service (or web service), discarding all the apparatus the specification requires for itself. This should produce a lightweight application profile of the IMS specification, providing just the interface required to pass information to and from a particular service and an e-Portfolio. By aggregating the interfaces for the services within a flow, such as ILP, we can develop a lightweight specification for ILP. Most importantly, all this work can be undertaken incrementally and grounded in pilot implementations.

Past IMS specifications were useful overviews of data across domains which now need to be broken down in order to provide the specific solutions that specific processes require. New lightweight specifications, aggregating interfaces that have been proved in practice, can then be developed as a basis for implementations funded by institutions.

Recommendation: The next stage of work should be to prove lightweight application profiles through pilot implementations of Transition e-Portfolio. These might form the basis of *de facto* standards for e-Framework services and flows of services which, over time, could be progressively standardised.

6.1.3 e-Portfolio enabled Services

The Reference Model is intended to provide the basis for other projects, in particular Reference Models of other e-Framework services. A significant amount of past work has focused on a few areas, such as Personal Development Planning, with positive results. However very little attention has been paid to equally important areas such as Information Advice and Guidance (IAG). There is a need to redress this imbalance and engage other practitioners and domain experts in other areas with e-Portfolio. This will include practitioners in learning services, e-Administration and researchers interested in learning and quality management:

Recommendation: Develop further Reference Models of e-Portfolio-enabled services, such as Advice and Guidance, and flows of services, such as Personal Planning, engaging new communities of practice beyond the PDP community with e-Portfolio.

The Reference Model has identified key flows. It has intentionally provided bare outlines that can be elaborated in different ways appropriate to the domain experts working in different areas. In other words

the Reference Model has provided a bare underlying pattern as the basis for the development of many versions of that pattern.

Recommendation: ask Reference Model projects of e-Portfolio-enabled services to provide an exemplification of a process alongside a basic representation of the underlying pattern that other developers can use to elaborate a range of new versions.

Recommendation: identify potential quick wins with high impact for priority development and in this way demonstrate the relevance of the e-Framework to meeting strategic objectives.

The e-Portfolio Reference Model project has had a strong focus on providing a basis for implementation, including the demonstration of web services, building on the team's experience of UK LeaP. New projects should build on this work to provide a range of implementations, in particular for HE admissions but also potentially in other sectors, and including transition to employment.

However, in order to stimulate and support implementation by HEIs at their own expense, there is a need for the results of these activities to be co-ordinated with other e-Portfolio services as they are fed back into the e-Framework and then presented in an accessible form within an expanding map of e-Portfolio.

Recommendation: continuing support should be provided to add the results of successor projects into the Reference Model and the e-Framework and to contextualise the information within wider information flows also relevant to e-Administration, such as those being re-engineered by MIAP.

JISC-CETIS should have a specific role in formalising the *ad hoc* standards that emerge from JISC-funded pilots.

Recommendation: JISC-CETIS should support projects and institutions actively exchanging information, and formalise, aggregate and disseminate the application profiles they prove, as part of a strategy to hand over the products of JISC investment for routine use within HEI and colleges' learning and administrative systems.

7 Outcomes and Results (C): Transition e-Portfolio used to model thin e-Portfolio in terms of the e-Framework

7.1 Requirements

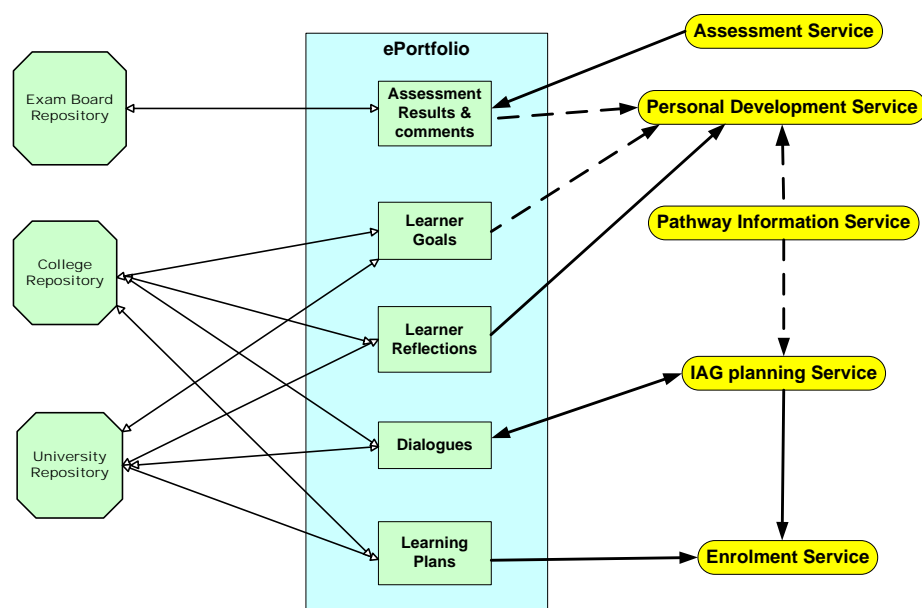
The concept of a thin e-Portfolio was technically attractive but had to be able to meet three key criteria for the Reference Model team at Nottingham:

1. **Practical implementation within a single institution:** the team had been responsible for the only institution-wide implementation of e-Progress File in the UK, and now needed to upgrade to e-Portfolio for students and staff.²³
2. **A lifelong model:** the team had piloted UK LeaP to pass e-Portfolio information from school to college and then university within a regional partnership. The practical implementation of a conceptual model had to reduce the complexity and cost of importing data into a University e-Portfolio (or of looking data up in a remote e-Portfolio). Parallel work was also undertaken with UCAS. This work had been funded by JISC.
3. **A lifewide model:** the University of Nottingham CETL for Integrative Learning, funded by HEFCE, will provide students undertaking any kind of work placements with an e-Portfolio, as part of a wider strategy for developing student employability. The model will have to integrate simultaneous learning in education and a workplace.

²³ This work had originally been funded by the DfEE with the University paying for its extension to the whole institution, some aspects of this original work are currently being trialled in China.

7.2 Thin e-Portfolio

Figure 5



The model is expressed as a flow of services (to the right of the diagram) which supports the development of an Individual Learning Plan similar to 5.2.1 but undertaken by a university student selecting modules for enrolment. An e-Portfolio application (the centre column) manages the data provided by services (the yellow lozenges) and provides data required by them. Repositories (to the left of the page) store the data. The storage of the information, the application serving the information and the services providing and consuming the information are separated.

The interfaces required to pass information to and from services should be identical to those required to pass the information to a repository, so no additional interfaces are required. An institution can prioritise the progressive implementation of interfaces as they are required.

Tools are becoming available to develop application profiles of this kind and a project has piloted these on IMS specifications including IMS LIP, of which UK LeaP is a specialisation.²⁴ The same project is developing a lightweight conformance testing regime that will allow the producer of information to certify that it conforms to an application profile. This is important for building confidence with the owners of services which consume information.

7.2.1 Reducing Complexity: Metadata

There is one unresolved complexity with the thin e-Portfolio model. Repositories are potentially high cost, largely because of the metadata they require. Could this complexity make e-Portfolio impractical?

All of the data within the model may require basic metadata covering rights of access, duration and intended function. Some of the data (for example the results of formal assessment held by an exam board or a university) will already have some additional metadata. It would be useful to review how much of this is present in the data flows reviewed by MIAP and Becta.

The fundamental question is, how much additional metadata is required? Existing products which form the basis of many users' current informal e-Portfolios often provide an opportunity for owners to add tags to objects and therefore to develop working conventions for themselves. Neither the functional need for additional layers of metadata nor their value to users is clear. A negative assertion cannot prove a point, but a positive need and business case is required to justify any significant investment for e-Portfolio.

²⁴ For the project see: <http://www.opengroup.org/telcert/> For an IMS perspective see <http://www.imsglobal.org/telcert.html>

The unpublished 3Square report on e-Portfolio for Becta makes an eloquent case for the efficiency of the kind of search tools available on the web against those available in repositories. Given that e-Portfolios are already held on web sites with informal tagging conventions accessible to web search, investment in this area might be more productive than further investment in repositories.

8 Outcomes and Results (D): Exemplification of an e-Portfolio ‘engine’ driving a further category of e-Portfolio processes: Integrative e-Portfolio

Annex 2 outlines an **e-Portfolio engine for Personal Learning Space** which could operate within a VLE or e-Portfolio system, or act as a hub for a regional partnership but which is intended to take advantage of the economies and opportunities which the development of Web 2.0 is opening out.

8.1 Defining an e-Portfolio Engine for Personal Learning Space

On a technical level e-Portfolio is not a *service* like *Assessment* or *Career Planning*. Rather e-Portfolio is an *application*, the **engine** which enables the individual learner to join together what they have learned through different *services*, so that they can demonstrate to another institution, an employer or a parent what they have done, how they are succeeding and who they are.

This project has defined the functions that such an **e-Portfolio engine** should perform, whether within current e-Portfolio systems, which are often specialised Virtual Learning Environments (VLEs) or within a wider Personal Learning Space, in order to enable individuals to:

- *integrate* what they are learning in different ways in different contexts;
- personalise their learning;
- and present themselves to a range of different audiences.

In this way the individual’s experience of learning may be transformed.

A learner should be able to replace a standard service provided within one e-Portfolio system with a different version of the service available from another provider which is better suited to their specific needs and preferences. For example, when I complete the staff review form for my employer, I may want to use the learning log provided by my professional association rather than the equivalent *service* provided by the employer’s e-Portfolio system. The employer’s learning log may cover any kind of professional employee, whereas the log provided by my association is customised to my specific area of professional expertise. The e-Portfolio engine enables this.

8.2 Developing Service Definitions

The e-Portfolio Reference Model project outputs include materials from which formal service genres and expressions are being developed for the e-Framework:

1. Narrative descriptions, in plain English, of processes described from the learner’s perspective, *scenarios of practice*
2. High level *use cases*, each expressing an individual process as a *flow of services*. This *encapsulates* (ignores) the types of data passing between the e-Portfolio *services* and *repositories*
3. More specific *use cases* of the *web services* within a *service* in which the data types are obvious if not explicit
4. The next phase of work should specify the data types within the use cases for pilot implementations (and then *ad hoc* and then formal standards), as the model is proven in practice, taking specific account of MIAP and Becta work on information flows.

From a business perspective, a modular service approach allows an institution to prioritise and customise the progressive implementation of ICT services. If it buys a ‘best of breed’ VLE containing a full range of *e-Portfolio services*, it may still find some of these are not well adapted to its specific needs and can replace them, adding new versions of *services* for learners with particular needs or preferences.

From the Learner’s perspective, an e-Portfolio engine within a Personal Learning Space would allow them to select the particular versions of *services* they prefer. Within the scaffolding provided by a controlled learning space which can be progressively personalised, learners entering vocational and professional employment will be able to develop the capacity to make effective independent use of Web 2.0. This is an important but neglected benefit of implementing e-Portfolio.

From a vendor (and developer) perspective, there are significant opportunities in developing software and hosting services. However, the model also allows a niche version of a service relevant to, say, 1,000 UK users to be widely sold, providing a low entry point to the market.

8.3 Next Phase of work

The April 2006 report commissioned by Becta from 3Square recommended that the work on Transition e-Portfolio led by the e-Portfolio Reference Model was mature enough for implementation, but that work on Learning e-Portfolio was less mature. The web services shared by both domains offer a means of exploring Learning e-Portfolio in the short term and develop evidence of its utility. Work in this area would also provide evidence of the effectiveness of an e-Portfolio engine which aggregates different learning experiences and adds value by integrating services.

8.4 Integrative Learning

Both the policy ideal of Lifelong Learning and the pragmatism of early implementation of Transition e-Portfolios focus attention most immediately upon chronological sequences of experiences of study and work, upon the fundamental linearity of pathways and progression. It is easy to assume that to align Learning e-Portfolios along the same axis, since they evidently support retrospective reviews and forward planning, is to capture what they do best. However, Learning e-Portfolios have an equally important function in supporting the individual to look sideways, to achieve overviews and understanding of synchronous learning, 'lifewide'.

The University of Nottingham CETL for Integrative Learning, focused as it is, in the first instance, on one specific phase of developmental experience for students, is interpreting e-Portfolio to take account of this lifewide diversity, supporting student's management and articulation of their learning, laterally, inside and outside the curriculum, perhaps in study and in part-time work, in arts, sports, voluntary work or work placement.

A further stage of work on e-Portfolios and the e-Framework, should explore the nature of the processes in which learners engage in order to articulate and synthesise the outcomes of parallel learning experiences in different domains. Mentors of all kinds potentially interact with learners in these lateral overviews. There is a strong likelihood that the personal skills and the web services needed to support the integration of diverse learning experiences through e-Portfolios are quite distinct from those services and web services which support application for transition and progression. The group of CETLs which share an interest in e-Portfolio offer a key constituency to take this concept forward.

Clearly, however, integrative learning needs to operate in many further contexts, not least in 16-19 education where a certain proportion of learners are increasingly likely to be studying in more than one institution at one time, as well as undertaking paid work or training. (See also *e-Portfolio for Development: Implementation by Regional Partnerships*, <http://www.nottingham.ac.uk/epreferencemodel/keydocuments/THINePregionV2bc.pdf>, for the technical support the thin model offers for integrative learning.)

9 Evaluation

A list of project achievements against the aims and objectives set for the project is provided by the report of the External Evaluator, given in full as Appendix A. His report as a whole offers an assessment of the value and benefits of the work of this project, with reference to its impact on a range of communities.

The Evaluator identifies the key achievements of this 'Reference Model' project, as:

- the definition of e-portfolios
- the building of consensual communities
- appropriate interoperability Standards developments.
- contribution to the e-Framework and the pool of related sample technical web service implementations.

The Evaluator also highlights further key features, including:

- the credibility gained through the project's engagement with real-life implementations in Nottinghamshire schools and colleges and in UCAS
- the links created with key agencies such as Becta and the DfES which led to members of the project team being instrumental in the development of national strategies in this area

- the recognition, by DEST, SURF and the EifEL community, of the project as a major contributor to knowledge in this field
- the exemplary professional standard of the specifications developed
- the demonstration of the relevance of the 'ePortfolio Engine' and the thin ePortfolio approach.

10 Recommendations

This report contains, highlighted through the text above, a number of detailed recommendations made by the project team, which are mainly in the form of suggestions offered to JISC on the directions future funded work should take in order to build on the work of the project, with some reference to the need to join up with the related work of further national bodies, principally MIAP.

In addition, further to his comments published in the interim report (April 2006), the External Evaluator's final review of the project includes recommendations for further work, listed in Appendix A. The Evaluator's points include specific suggestions as to the key components of the successful project work which need to be sustained, if JISC's work on e-Portfolio is to move forward rapidly. These include: reinforcing both the strategic and implementation partnerships which have been formed, and continuing to contribute to standards development on the basis of 'real life' implementations. He also emphasises the importance of validating the e-Framework at micro as well as macro level and developing further 'thin ePortfolio' models in order to demonstrate the flexibility offered by the standards and web services based approach.

11 Implications

The project has engaged external stakeholders responsible for developing national policies for e-Portfolio who have carefully reviewed its strategic implications. Major areas for development identified by the project team include the following:

1. There is an increasingly strong emphasis on **employability** and involvement of employers in the curriculum in all education sectors, exemplified in relation to 14-19 by the **Specialised Diplomas** being developed by the Sector Skills Council, especially **eSkills**, and for HE by the Secretary of State's **letter to HEFCE of 31 01 06**. These initiatives often make use of an assessed ePortfolio focused on professional and personal development. As well as the linear transition of learners from education to employment, there is a significant increase of **Lifewide** learning in both education and employment environments; ePortfolio will have an important role in relation to **regional partnerships** and **Lifelong Learning Networks** to support work-based learners. The Reference Model has scoped this area and could make recommendations on the kind of work JISC might wish to fund projects to undertake.
2. In order to take Lifewide learning properly into account alongside Lifelong Learning, the services for **Integrative Learning** need to be developed, to search for relevant evidence, synthesise evidence, and enable a learner to take a strategic view of their achievement across both dimensions. This may connect to planned XCRI work.
3. **eAdministration** The flows of services identified by the Reference Model frequently involve both learning and administrative services. The work with UCAS takes JISC into mainstream administrative processes.

The future of the Reference Model

The University of Nottingham Centre for International e-Portfolio Development is committed to taking various aspects of this work forward within the University and the region, through the JISC JOSEPH project, the e-Portfolio strand of the Derbyshire-Nottinghamshire Lifelong Learning Network and its research programme. It offers ongoing stewardship of the e-Portfolio Reference Model for the community, through a dedicated website capable both of receiving materials from forthcoming scoping studies and new projects and of providing facilities to support research.

Appendix A: External Evaluator's report

A.1 Evaluation Report: Clive Church, JISC-CETIS

1. Methodology

CETIS made the monitoring of JISC Portfolio projects a focus for their Lifelong Learning Group. UK government prescribed national developments in this area with defined milestones generated the need for a source of pedagogical and technical expertise. CETIS in order to support these initiatives had to work in partnership with others to provide credible advice and support. I worked closely with the Nottingham University and Nottingham LEA teams to help satisfy this requirement and, with the associated RIPPLL project, attended 16 meetings and events since April 2005. This continuous engagement and appropriate recording of events provides the background for this evaluation.

2. Summary

The team delivering a project with initially a fairly narrow remit concerning:

- The identification and refinement of narrow model use cases
- The development of UML Based methodologies for representing such use cases
- The production of pilot implementations
- The provision of advice and guidance for national and international developments

has discovered that the final bullet point (influencing developments through the provision of advice and guidance) has had a significant impact on the strategies of key educational agencies.

The ePortfolio domain has (and continues to) be dogged by confusions over definitions and implementation models. In this space, the production of a consensual Reference Model was to be a challenge.

Building on to, complementing and sharing many team members with the DEL RIPPLL project, this Reference Model obtained credibility through its engagement with real life implementations in Nottinghamshire schools and colleges and UCAS.

This credibility extended by links with key agencies such as Becta and the DfES has led to members of the project team being instrumental in the development of national strategies in this area. Its contribution to the development of standards with BSI and CETIS is also important as is the support to parallel international initiatives in Holland and Australia. There also have been technical implementations of web services to support these projects which although in need of some refinement provide a competent showcase for examples of Web Services implementations.

As a 'Reference Model' the project has achieved its aims in contributing to

- The definition of e-portfolios
- The building of consensual communities
- Appropriate interoperability Standards developments.
- The e-framework and the pool of related sample technical web service implementations.

It has not fully defined a methodology for 'Use Case developments using UML' although the production of transferable diagrammatically represented use cases will be of value. Its contribution to re-usable web services is useful (but needs refinement) but as an example of how JISC projects can influence national and international strategies in a learning technology domain this project is exemplary.

3. Satisfaction of Aims

Based on transitions through different stages of learning (school, FE, HE and employment to:

	Evaluation
Build consensus concerning components of services and aggregations	The project contributed significantly to a consensual acceptance of a component view of the ePortfolio 'data space' and of a service oriented architecture approach. The identification of particular

	services that aggregate other lower level services has been demonstrated.
Investigate whether patterns of architectural implementation can be replicated elsewhere	An important outcome from the project. Models based on XML (including SOAP) and the use of XSLT have been developed for the transfer of data. The data definitions used have relied heavily on the BSI proposed standard (LEAP) and provide a useful model for replication not only in the ePortfolio world but in SOA community too.
Provide an outline definition of ePortfolios	Wherever more than one learning technologist meets there will be a discussion on the definition of an ePortfolio. The project in scoping the domain in terms of data models and the resulting range of services has provided a credible definition acceptable to those within agencies such as Becta that have to make important strategic decisions. A definition in terms of 'a range of services' and 'the data models that underpin those services' is beginning to emerge.
Investigate synchronisation with e-assessment processes	The adoption of the BSI LEAP as the starting point for the data models used by the project has provided a framework to integrate coursework assessment (ePortfolio domain) with other e-assessment processes covered by the FREMA project
To support government initiatives (e.g. DfEs Strategy)	A major success of the project has been its adoption by key agencies within the UK and elsewhere of this and related work as a major source of current expertise in this field. The membership by representatives of the team of the DfES Technology Unit's Information Standards Board that will prioritise and monitor interoperability standards developments in this area for all educational sectors within England is a demonstration of the project's importance. The project has provided major input into the BSI LEAP developments and has been recognised by DEST, SURF and the Eif-I community as a major contributor to knowledge in this field.

4. Satisfaction of objectives

Based on services:

- Application from school to college
- Transfer of ePortfolio materials form college to university
- Application from undergraduate to post-graduate using the CEDEFOP Diploma Supplement

....and an iterative approach:

Use cases and statement of types of information required	Based on the template identified in the bid narrow use cases/ data flows in each domain were produced. (These have been iteratively refined). The 'use cases' have been shown to be easily transferable (and hence appropriate) to other communities and application areas.
Definitions of common services: linked to ELF	The relationship between the authorisation and authentication and filing elements of the e-framework have been investigated. More work needs to be done in validating the common services identified within the e-framework and producing alternatives. Links with the XCRI project has identified a joint approach to the e-framework development.
Development of UML Diagrams Mapping to XML (data models) Identification of discrete service components	UML was not strictly adhered to. Internal conventions to model the domain were produced to meet the changing needs of the project. Staff training, however, was given to partners on UML in preparation for further work, if required.
Methodology for further development of reference	The use of UML has been identified as a future objective. 'Thin ePortfolio models' in terms of data flows that identify links to the e-

model	framework have been produced (and will be further developed) to demonstrate the need for documentation of the types of services covered within this domain. Draft architectural models for this application area have also been produced for discussion.
Identification of opportunities for aggregations of services	Service aggregation (authentication) was touched on but more work has to be carried out on the orchestration of basic services to facilitate reuse within the full range of user applications. The work re-enforced the need for a more dynamic e-framework (different types of brick) and the need for identification of lower level services.
Reference implementations: Transfer of personal statements between institutions Providing transcripts within a presentational ePortfolio	Documented web services based examples provided in both partnership with UCAS for transfer of Personal Statements and with the Nottingham LEA for transfer of application data between schools and FE colleges and Connexions
Consultation (Workshops, events and use of interactive website)	The website was continually maintained. Workshops and events include: <ul style="list-style-type: none"> • Related JISC ePortfolio projects workshop • Management of ePortfolio theme: JISC/ CETIS Conference • CETL Workshop • Talk 2005 Eif-L Conference Cambridge • Attendance joint JISC/ SURF meeting Amsterdam • Hosting joint JISC/ SURF meeting, Nottingham Joint management with NILTA, RSCs and CETIS of Nottingham event
National and international ePortfolio Network	The networks created and maintained by partners of this project is a significant output. The credibility of links with high profile stake holders has led this project to be a source of expertise on ePortfolios within the educational community. (See below for details)

5. Stakeholder engagement (external)

CETIS and standards	The link between CETIS was strong due to both my own and Peter Rees Jones's role within the service.
UCAS	UCAS's decision to be a key implementer of LEAP was a significant step forward for the acceptance of these standards and a services approach. The UCAS link enabled the outputs of this Reference Model project to influence government initiatives concerning a Service Oriented Architecture approach to university admissions
UCISA	Meetings have taken place, Dissemination provided.
QCA	QCA has attended appropriate events and through the DfES and Becta will obtain expertise from this project. The QCA's responsibility for developing coursework assessment mechanisms and implementing the 'Framework for Achievement' will rely on the outcomes for this project.
egif	The changing role of 'e-gif' to 'e-gov' has led to standards developments in the educational field being the responsibility of the DfES Technology Unit with which the project has links.
UFI/ Learndirect	The loss of responsibility by UFI/ Learndirect for contributing to interoperability standards (developments in addition to its role as an online course deliverer) and resulting staff changes has resulted in few links being maintained through much of the project. Links with Ufi/ Learndirect have now been re-established.
European Schoolnet	No input
Becta	By both visits to their offices and engagement with other events in Nottingham and elsewhere the project has a significant role in supporting Becta in their role for defining the specifications for the tools

	to be employed by the schools and FE sectors. The outcomes of the project have contributed to positioning papers concerning ePortfolios and eAssessment. The project has had a major impact on Becta's work in implementing government strategies
DfEs	The project has been a major source of advice for the DfES on how to proceed on ePortfolio developments in England (outside HE). Representatives from the DfES have attended several of the dissemination and related steering group meetings organised by the project team.
Other JISC projects	Through organised events and a readiness to share expertise and experience, the project team has engaged pro-actively with related projects in this ePortfolio domain.
Vendors	Currently limited to those project partners who have supported the pilot implementations. Vendors such as the 'Tribal Group' have maintained a watching brief but the nervousness of most vendors to adopt a Service Oriented Architecture approach has limited more direct contact

6. Stakeholder (internal)

Senior managers HEI, Schools, Colleges etc.	Success of the project contributed to successful bid for a CETL (Integrative Learning) and the investment by the University in a 'Centre for International ePortfolio Developments'. Contacts made via associated projects (RIPPLL) whose partners had to authorise release of staff insured engagement with the needs of a wider community.
Greater Nottingham 14-19 Strategy	A key element of this project. Work by the Nottingham LEA team in producing the 'epassportfolio' standards based systems for the processing of applications from schools to colleges has provided a 'real life' test bed for the project. The use of LEAP based standards for transfer of data and the development of appropriate web services has depended on the expertise within this and related projects
Widening Participation teams	The data transfer models piloted by this and related projects will be useful to Foundation Degree H/FE partnership implementations
Tutors in F/ HE	Generally limited, to date, to those involved in the development of the 'epassportfolio' project, above. Planned dissemination events will provide further opportunities for dissemination to this group and their student records/ information services colleagues.
Students	Limited, to date, but the above ePassportfolio implementation supported by this work will soon benefit many youngsters in Nottinghamshire.
Career Staff	Limited to date to those involved at the CONNEXIONS agency in development of epassportfolio project, above.
Technical Staff	Updating of the skills within the University and partners in web services implementation has been apparent
Employers	Links have been made with local industry and Connexions on the benefits of adherence to standards and a 'services model'. In particular the foundations have been made with Toyota Lexus and Rolls Royce for further joint developments.

7. Recommendations for future work

- Re-enforcing Strategic Partnerships:
Continuing work in ensuring major stakeholders within the UK (and internationally) maintain a consensual view of the e-portfolio data definitions and services is important.
- Continuation of Implementation Partnerships:

Continuation of partnerships with key implementers of the standards, data definitions and services (such as UCAS and the Nottingham LEA) within the domain of this Reference Model in order to maintain credibility for this work is vital

- **Contribute to Standards Development.**
Work with BSI, CETIS and others to develop a standards framework that will both enable interoperability across sectors and the facilitation of a wide range of services must be continued. Few others can contribute with the authority of having been involved with 'real life' implementations.
- **Further contribution to/ validation of the e-framework.**
From links with other Reference Models, additional work must ensure that the web services approach enables re-usability of tools with/ from other domain areas. Future work will need to identify levels of services below the macro application areas currently employed within this model. Future work should also contribute to the development and monitoring of a dynamic e-framework ('updating the bricks').
- **Modelling of Use Case**
The development of further 'thin ePortfolio' models in terms of data flows that identify links to the e-framework need to be developed in order to demonstrate the flexibility offered by the standards and web services based approach.

Clive Church, 23 March 2006

A.2 Evaluation: Allocation of additional funding to increase the impact of the eFramework Model

1. Introduction

In March 2006 the project was awarded further funding to

- Develop reference model implications that support the development of the model and proof of concept.
- Continue with consultation and dissemination activities
- Explore issues concerning ongoing maintenance and requirements for sustainability of the reference model

2. Proposed Activities, their results and impact

Activity/Task	Result	Impact
Demonstrations to develop model and prove concept: develop and demonstrate web services for users of the structured personal statement template	A set of appropriate web services were investigated and specified for UCAS-based applications	The specifications developed have been professional and have, through dissemination to the FREMA Reference Model, been identified as exemplary templates for other web service applications. The set of specifications has demonstrated the relevance of the 'ePortfolio Engine' as a pool of generic web services that can be modified to meet disparate applications. The thin ePortfolio approach of taking a slice of the domain at a time and tailoring the generic services within the 'engine' has proven to be successful.
Consultation, validation and dissemination activities	Key sector bodies were continually consulted and events as identified in the proposal were run.	The project with other related work has continued to provide direction for national bodies and initiatives. The team has proactively maintained links with Becta. Through its partnership with DfES and CETIS and development links with UCAS and awarding bodies the project has maintained its role as a reference source for both ePortfolio strategists and systems developers.
Addressing sustainability issues – short term	A further Nottingham-led project under the JISC Capital Programme: 'Cross-institutional use of e-learning to support lifelong learners' will both sustain and further develop the work. This will involve engagement with both employers and vendors and provide opportunities to develop and further expand the expertise of technical staff in this area	Sustainment of both current initiatives and the momentum to expand the community accepting the eportfolio paradigms underpinning the Reference Model is evident in the developing objectives and strategies.
Submitting the Model into the eFramework	JISC programme team is fully engaged	

3. Recommendations for further work

- Provision of two discrete and easily accessible indexed information sources. The first for developers who want to employ / tailor appropriate web services and application profiles and the second for research and research related papers. These 'repositories' should be complemented by 'spaces' for comment (such as wikis) underpinned by a pro-actively supported community.
- Enhance the credibility of the work underpinning the model by its application to other areas (such as achievement recording) within the ePortfolio domain.

- Development of a pragmatic XML based standard for data transfer within the e-Portfolio domain. This is an urgent requirement to provide both interoperability across JISC projects and a basis for the wider educational community to obtain efficiencies from the application of standards.
- Provision of pro-active support for national bodies in the satisfaction of their objective of producing computer based systems that handle both effectively and economically the transfer and processing of data within the e-Portfolio domain.
- Lead the development of a community of key players and stakeholders within the e-Portfolio domain who can develop a consensually agreed pragmatic successor to the UK LeaP approach for the achievement of interoperability.
- Contribute to the objectives and scope of generic Reference Model developments.

Clive Church, 13 September 2006

Appendix B

Glossary of Acronyms

Becta	British Educational Communications and Technology Agency
BSI	British Standards Institute
CETL	Centre for Excellence in Teaching and Learning
CISG	Corporate Information Systems Group
CV	Curriculum Vitae
DeL	Distributed e-Learning
DEST	Department of Education, Science & Training (Australia)
DfEE	Department for Education and Employment
DfES	Department for Education and Skills
FE	Further Education (post-16 in the UK)
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institution
HR	Human Resources
IAG	Information, Advice and Guidance
ICT	Information and Communication Technology
ILP	Individual Learning Plan
IMS	Instructional Management Systems (now IMS Global)
ISO	International Organisation for Standardisation
ITT	Invitation To Tender
JISC	Joint Information Systems Committee
JISC-CETIS	Joint Information Systems Committee
JOSEPH	Joining up Organisations to support new Engineering Pathways into Higher Education
KS4	Key Stage 4 (ages 14-16 in the UK)
LEA	Local Education Authority
LIP	Learner Information Package
LLN	Lifelong Learning Network
MIAP	Managing Information Across Partners
PARs	Personal and Academic Record System
PDP	Personal Development Planning
RIPPLL	Regional Interoperability Project on Progression for Lifelong Learning
SIG	Special Interest Group
SPA	Supporting Professionalism in Admissions
SURF	NL Higher Education and research partnership organisation for network services and ICT
UCAS	Universities and Colleges Admissions Service
UCISA	Universities, Colleges and Information Systems Association
VLE	Virtual Learning Environment
XCRI	eXchanging Course Related Information