



# JISC Distributed e-learning programme

## Final Report

This document provides the final report for the L4All pilot.

### Project

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## Executive Summary

The main aim of the LifeLong Learning in London for *All* (L4All) project was to *support lifelong learners* in the London region, providing them with access to information and resources that facilitates their progression from Secondary Education, through to Further Education (FE) and on into Higher Education. In order to achieve this aim, the main objective of the project was to develop and evaluate a system that allows learners to access information and resources registered with the system by their providers, to plan their own learning pathways, to share experiences with their peers, and to maintain and reflect on their learning throughout life. The functionality of the system would be accessed by a Web Portal and would be provided, as much as possible, by existing JISC-funded tools and services compliant with the JISC E-Learning Framework and service-oriented architecture.

L4All represents the learning pathway of a lifelong learner as a timeline consisting of educational and career choices, critical decision steps, and factors or events that have influenced individual learner's progression and professional development. The theory behind the concept of the learning pathway as used in L4All can be attributed to Vannevar Bush's trails concept (1945).

The L4All team began by defining the user and technical requirements of the system. The user requirements were derived from a set of usage scenarios that were synthesised from a series of interactive workshops with targeted user groups and an ongoing consultation process with stakeholders, including Aim Higher, Connexions, Prospects and UCAS. On the basis of the identified user requirements (e.g. requested search functionality, course and timeline management features and user profile creation and editing) functionalities and various services and components were specified for the L4All pilot. The service-oriented architecture and the features of the first version of the pilot were defined and a release plan for the pilot along with features in each release phase was created. Metadata schemas and usage scenarios of the pilot were also developed. Evaluation activities were designed to inform both design parameters (are these the right tools/functionalities to develop?) and usability issues and concerns, including accessibility (can learners use them effectively?).

Following this thinking, the first version of the pilot was created and tested in a pilot user study. This study demonstrated at an early stage of the project that the proposed representation of learners'

career and educational history could benefit lifelong learners in effectively planning their learning and work choices. The findings of this evaluation study were used to improve the functionalities in the second version of the pilot, such as searching metadata, manual pathway creation, searching learning pathways, pathway and content annotation, pathway visualization, as well as refining the user interface.

The second version of the L4A// pilot can be conceptually divided into two levels: (i) the backend and (ii) the user interface. The backend provides connections to RDF repositories for retrieving, storing and modifying the user and course metadata, integrates external JISC services and then wraps them all under a set of web services that the user interface is able to use. The user interface consists of two parts. A web portal that acts as a building platform for the user interaction components to be built upon and a Flash-based interface that interacts with the backend and implements most of the user functionality for creating personal timelines, searching the available courses, searching other users and their timelines. In its final version, the L4A// pilot integrates three external services. Two of them were developed in other JISC-founded projects: the DELTA service (Essex) for searching over the RDF metadata resources and the ISIS/ASSIS (Hull) sequencing engine for providing sequencing over a set of courses according to a set of criteria. The third service was developed by University for Industry (Ufi) LearnDirect ([www.learndirect.co.uk](http://www.learndirect.co.uk)) and is used for searching and obtaining information for the full set of courses of the LearnDirect database.

The evaluation of the second version of the pilot focused upon three main user groups: Institute of Education Teacher education learners, Birkbeck College IT Applications (IT Apps) learners and FE learners from Community College Hackney. This process provided formative feedback to the team, supporting changes to the incremental prototyping of the pilot. The primary finding of these studies was the endorsement of the project concept. There was agreement across all groups of the value of this work, and its potential to support otherwise excluded groups of learners. It is particularly interesting to note the particularly positive response from the FE learners, which suggests that this might be a particularly appropriate group to focus further development work around. The evaluation study has also been useful in identifying areas that require further technical refinement and development. Although the L4A// pilot has potential, there is still work that needs to be done before it would be plausible to offer this as a lifelong learning service, although the beta version of the pilot may be available shortly online as part of the formative user evaluation. Additional functionality has also been identified that would be a valuable addition to future version of the system, such as links to e-portfolios and/or journals.

All public project documentation is available on the project web site at: [www.lkl.ac.uk/research/l4all/](http://www.lkl.ac.uk/research/l4all/). A demo version of the L4A// system is available at: <http://l4all.dcs.bbk.ac.uk:8080/l4all-v2/>.

## Background

The **LifeLong Learning in London for All (L4A//)** project has focussed upon the theme of 'Supporting the independent lifelong learner'. The focus has been on helping those post-16 learners who traditionally have not participated in higher education. This problem is complex and multi-faceted but we believe, on the basis of research into life course choices, that there are two closely related issues that contribute to this situation: firstly, a lack of information about education opportunities, and secondly a perception that such options are 'not for me', leading to self-exclusion from such opportunities. The situation appears to be particularly acute for those who identify themselves as being from ethnic minorities or as having an impairment that may affect their participation.

L4A// aims to provide lifelong learners in the London region with access to information and resources that facilitates their progression from Secondary Education, through to Further Education and on into Higher Education. Emphasis has been placed upon widening participation and catering for specific needs and requirements of user communities which have been traditionally under-represented in higher education. To achieve its aims, the L4A// project has brought together a broad group of people from different disciplines and a range of institutions all of whom are committed to providing learning opportunities which enhance career development and widen participation across the London region.

The L4A// project has built upon earlier research projects undertaken by researchers from Birkbeck and the Institute of Education at the London Knowledge Lab, including the EU-funded SeLeNe project (Keenoy et al. 2005; Peterson and Levene, 2003) and the EU-funded Kaleidoscope project (Keenoy et

a). 2004a, 2004b). The L4AII pilot has also built on recent work on learning object *trails* undertaken by researchers at Birkbeck and the Institute of Education (Keenoy *et al.* 2005, 2004a, 2004b, Peterson and Levene 2003). In particular the trails concept has been developed further in the current project and has provided the basis for modelling user behaviour and informing system designs. L4AII allows tutors and learners to create *learning pathways* through the learning resources registered with the portal by their providers. As an aid to constructing their own learning pathways, learners are able to search for pathways provided by tutors and other learners. This gives learners a repertoire of learning possibilities that they may not have otherwise considered, allowing sharing of successful learning pathways and presenting successful learners as role models to inspire confidence and a sense of opportunity amongst those previously excluded.

## Aims and Objectives

The project aimed to develop a pilot that would provide an environment for the lifelong learner to access quality-assured learning materials, personal development plans, recommendation of learning pathways, personalized support for planning of learning, and reflecting on learning. Specifically, the pilot aimed to offer:

- (i) interaction with a Web Portal that provides information on work-based, FE and HE courses and modules available to learners in the London region;
- (ii) personalized support in planning and reflecting on personal development and lifelong learning activities;
- (iii) advice on learning and personal development pathways;
- (iv) support in designing and maintaining personal learning and development plans;
- (v) allow learners to share information and collaborate with peers and tutors.

The following objectives were identified to achieve this aim:

- (O1) Definition of the **User Requirements, Usage Scenarios** and **Technical Requirements** of the pilot.
- (O2) **Metadata generation and provision.**
- (O3) **Development of the pilot.**
- (O4) Employment of a user-centred **Evaluation Process** that uses usability inspection methods, including user testing and heuristic evaluation, to improve the pilot so that the needs of learners and providers can be met.

These aims and objectives did not change during the project and the project has achieved all of its stated objectives, as discussed in the section on Outputs and Results detailed below.

## Methodology

The methodology adopted built upon existing projects and research conducted by members of the London Knowledge Lab (Keenoy *et al.*, 2005, 2004a, 2004b; Papanikolaou *et al.* 2003, Peterson and Levene, 2003).

The project was structured around a number of packages. First, the **User** and **Technical Requirements** were produced as part of Work Packages 3 and 4 respectively (Work Packages 1 and 2 were the Management and Dissemination work packages that lasted the duration of the whole project).

For the **User Requirements**, we first considered previous models of learner choices in career and education. These previous models were rational and economic choice based and therefore a poor match with the target learner community. We therefore proposed an alternative model based upon *trails* (Bush, 1945; Peterson and Levene, 2003) of learning resources and opportunities, which we believed could provide a more holistic approach to learners' experience of life and continuity between their learning episodes and work experiences. We conducted a series of user studies which aimed to define the users' needs and requirements of the system, including the main functionality required, how this functionality should be provided to the user, information to be solicited from users, the information to be returned by the system, and the interaction between different components of the system.

Usage scenarios for the L4AII system were formulated by consultations with relevant stakeholders, including widening participation officers of the institutions and colleges of the consortium, groups of learners, tutors, student liaison committee members, and content providers. Among the main aims of this consultation process was to identify learners' individual educational goals and objectives, articulate expectations for the learner's performance in general education activities, and accommodate different user needs and individual differences (such as age, level of literacy, ethnic minorities, special needs, accessibility requirements). The outputs of these sessions are reported in Deliverable **D3.2** and provided the basis of the user requirements and specification of the system - as included in Deliverable **D6.1**.

The initial technical requirements as stated in the project proposal were that the L4AII functionality would be accessed by a Web Portal and would be provided, as much as possible, by existing JISC-funded e-tools and services compliant with the JISC E-Learning Framework and service-oriented architecture. The L4AII **Technical Requirements** (reported in **D4.1**) were therefore elicited by (i) undertaking a study of candidate portal technologies and a critical evaluation of them that identified *uPortal* as the most appropriate choice; (ii) undertaking a study of existing e-tools and services provided by other JISC-funded projects that could provide relevant functionality to L4AII; (iii) specifying a system architecture that used a selection of such e-tools in addition to *uPortal*, Apache Tomcat 5 and Apache AXIS SOAP; (iv) undertaking a study of e-learning metadata standards relevant to the L4AII application domain that identified *IMS Metadata*, *IMS-LIP* and *eduPerson* as the most appropriate standards to be used as the basis for describing the L4AII learning resources (IMS Metadata) and the L4AII users (IMS-LIP and *eduPerson*); and (v) identifying RDF and the Jena2 framework as providing a flexible, portable solution for storing the L4AII metadata.

After the specification of the User and Technical requirements, followed the **Development of the pilot** (Work Package 6) and the **Metadata Provision and Generation** (Work Package 5). A number of extensions to the standard metadata schemas were first designed in order to fully support the L4AII functionality for users and trails of learning objects, and these extensions are reported in deliverable **D6.1**. Also reported in D6.1 is the functionality, design and implementation of the first version of the pilot.

The pilot was developed in two phases, resulting in two versions during the lifetime of the project. This was in order to allow an early first phase of evaluation that would allow the user requirements and usage scenarios to be validated by a range of user stakeholders. This would demonstrate the benefits of a large subset of the envisaged functionality of the pilot, detect non-compliant situations and identify possibilities for improvement. The outcomes of this first evaluation phase served as input into the development of the second, functionally complete, version of the pilot. The outcomes of the second evaluation phase, just completed, will be used to make any further necessary improvements before the public release of the third version later in 2006.

This first version was produced by July 2005 and incorporated the requirements identified in Work Packages 3 and 4 relating to search of learning objects (provided by DELTA), trail creation and management, searching on trails, and user profile creation and management. Further improvements were made to this first version of the pilot during the first evaluation phase during July – September 2005, relating mainly to trail creation, annotation and management. The second version of the pilot incorporated also a visual front-end and an automatic course sequencing service (based on ISIS) and was completed in February 2006.

The **Metadata Provision and Generation** work package used the L4AII metadata specification output provided by Work Package 6. Staff with responsibility for managing the information required for the L4AII metadata fields were identified within Birkbeck, the Institute of Education and Community College, Hackney. Once the metadata schemas were complete, the project administrator liaised with these staff in the generation of the necessary RDF metadata for loading into the pilot's RDF repository via a simple loading tool developed by the technical team.

The **Evaluation** work package (Work Package 7) was organised in two phases. The first phase focused upon the first version of the pilot and aimed to fine-tune the user requirements and usage scenarios through consultation with student representatives, tutors, widening participation officers and content providers by examining how different users interact with the system. The results of this evaluation demonstrated the benefits of the pilot, detected situations where the pilot did not satisfy

learner needs, and identified possibilities for improvement particularly in the user interface. The outputs of the first phase helped to identify decisions and initiate actions in order to implement these improvements. The second evaluation phase was on the second version of the pilot. This phase adopted heuristic evaluation methods focusing upon usability issues, as defined by Nielsen (2006) and Nielsen and Loranger (2006). To ensure that the final pilot was robust enough to cope with real-world use, it was imperative that users evaluate it to assess their acceptance, behaviour and performance, and determine if the user requirements have been fully met. This second evaluation round has taken the form of remote usage of the system in conjunction with an online survey, face-to-face interviews with learners and discussions held using the Blackboard virtual learning environment. The evaluation has centred upon different user groups – learners, tutors, widening participation officers and content providers. The feedback from these workshops will be used as measures of user acceptance to undertake any further necessary improvement to the pilot before releasing the final version (version 3) later in 2006. The findings of the evaluation phase are reported in **D7.2**.

We are aware that the potential significance of this approach is a long-term one, involving the identification and sharing of successful educational pathways and the impact of this on learner choice. Such impact can only be studied longitudinally, making it feasible as part of the operation of a funded service but difficult to achieve within a pilot. Our evaluation effort will work towards the identification of impact, but will focus primarily on evaluating acceptance, usability and perceived impact. The evaluative study will continue into the continuation period in order to provide more longitudinal findings as to impact of the system upon career choices and education decisions.

The **Shibboleth** workpackage (Work Package 8) began with an identification of resource repository platforms and attribute schemas, in a series of meetings held with technical contacts in the partner institutions that will host end-users or access-controlled resources. Several of them do not have the technical resources needed to ensure the appropriate infrastructure for describing their users (e.g. an up to date LDAP server), and enabling such resources was not within the remit of the project nor was it something that could be accomplished with the project resources in the timescale required for the pilot. To alleviate this situation, we concentrated on adopting an architecture that will cover the pilot only. The outcomes of Work Package 8 are reported in **D8.1** and **D8.2**.

## Implementation

As discussed above, we planned the project according to a workpackage structure, where tasks and outcomes were grouped together and scheduled accordingly – please refer to the project plan for full details. As discussed in the original project plan, the core project team comprised project and technical directors (G. Magoulas and A. Poulouvasillis), a project manager (S. de Freitas), a developer (G. Papamarkos), an administrator (F. Mohamad), and a user requirements and evaluation team (M. Oliver, I. Harrison, A. Mee). The core team was supported by an access management team (J. Paschoud, S. McLeish) that provided advice on Shibboleth authentication and authorization issues. Metadata inputting and support with user studies was provided by Community College Hackney (M. Andrews, M. Marshall). Core team meetings were held every two-three weeks to review progress and plan in detail the next phases of work. Regular meetings were also held as necessary throughout the project with the broader set of partners and the advisory group. Communication with the JISC has been ongoing and as well as attending advisory group meetings, Sarah Davies has provided support to the team, communicating JISC events and providing contacts with local Learning and Skills Councils (LSCs) and Prospects.

Budget expenditure was monitored by the project directors, day-to-day administration of the project was overseen by the project manager, and administrative duties were undertaken by the project administrator.

In addition to the core team, external developers were subcontracted to undertake front-end design and development work in Flash. The main reason for bringing in external developers was due to problems with VMAP software which would have needed more development time in order to allow it to be integrated with our portal system.

Smart space, an online collaborative tool, was used throughout the project allowing for meetings to be scheduled, documentation to be held centrally and resources to be accumulated collectively. The use of the tool significantly eased the administrative burden of the project and allowed greater flexibility in

terms of part-time work schedules. We worked closely with the LKL web developer to produce the project web site (based upon a content management system), and all public documentation and other project related information was uploaded at the earliest times to facilitate good dissemination practice in line with JISC project management guidelines.

The user requirements study was based upon learner trails as a basis for developing the L4A// pilot. It was conducted from February 2005 to May 2005 and included in-depth interviews with 16+ learners from FE colleges and mature learners on the part-time IT Applications programme at Birkbeck, as well as a series of focus groups of people aiming to enter teacher education, held at the Institute of Education. In addition, an expert workshop including recruitment and career specialists and course tutors and directors from HE and FE, as well as a representative from Registry, was held at the London Knowledge Lab.

The technical work of the project concentrated on web services integration, interfacing with the uPortal framework, and on exploring the integration of services and Shibboleth components. A number of services were considered in the process of putting the portal components together. VMAP was not available as a service in time, and therefore was not integrated with the portal. After consultation we decided to design a Flash-based interface in order to provide users with easy access to the various services integrated in the pilot, and subcontracted this activity. Open Mentor was considered as a candidate for integration but the main problem was that it was lacking the required service-based call interface that would allow integrating it with L4A//. ISIS was incorporated into the portal and can be used to automatically create sequences of trails. DELTA was successfully integrated into the pilot. In L4A//, DELTA searching has been combined with the the Learndirect search service to provide personalized search results.

uPortal (the portal framework used in L4A//) has also proven rather problematic as uPortal is designed to be used in university portals and not in portals which are open to public access like the one L4A// provides. This made the implementation of some features, such as user registration, unnecessarily difficult.

Work on Shibboleth integration with uPortal itself proved to be much more difficult than originally envisaged, due to the need to extend the Shibboleth architecture to permit delegated authorization (so that portal users can be "pre-authenticated" to information delivered through portlets/channels). The first draft of the extension to the Shibboleth profiles that are needed to support this were published for comments by the Shibboleth/internet2 consortium very late in the project (October 2005), and code supporting them has not been released yet. The L4A// portal is unusual in that it does not contain pointers to large quantities of external interactive resources (in the form of servlets or channels). This means that much of the Shibboleth-related work done on portals so far has been held up to address use cases which are not themselves of importance in the L4A// context.

The evaluation process was undertaken between July 2005 and March 2006 and focused upon both first and second versions of the L4A// pilot. The first phase was undertaken between July and September 2005 and the second phase took place in March 2006. The evaluation process focused upon three main user groups: learners, prospective learners and careers advisors. This process provided formative feedback to the developers, resulting in corrections and improvements to the pilot. The evaluation activities were designed to inform both design parameters (are these the right tools to develop?) and usability issues and concerns, including accessibility (can learners use these tools?).

Each of the two phases of the evaluation involved primarily usability testing methods (Nielsen 2006; Nielsen and Loranger, 2006). The first phase was aimed at providing information to the technical team to allow the development and refinement of first version of the system. Given this purpose, conventional Human-Computer Interaction methods were adopted for this phase of the evaluation. The second phase of the evaluation though adopting the same methodology also aimed to validate the pilot system by seeing whether learners and prospective learners were able to make use of the system as part of the process of choosing lifelong learning opportunities.

## **Outputs and Results**

The project has adhered closely to the original project plan, milestones and deliverables. The L4A// pilot has achieved almost all of the user requirements identified in the early part of the project,

successfully integrating a set of external services, tools and resources exhibiting high heterogeneity. Using a broad range of technologies and standards we have build a prototype system that combines these external services, tools and resources with our own in-house customization and development in order to provide a complete system through which the lifelong learner is able to access information about learning opportunities in the London area, create learning pathways through this information space, and search for existing pathways created by other people or automatically generated by the system.



**Figure 1. User interface for timeline creation.**

With a focus upon personalizing the learner's experience and in an attempt to make it easier for established and prospective learners to follow a continuous path from school to FE and onto HE and work, we argued that a more holistic approach was required. The project promoted a user-centred approach to development. This has been possible in part by scenario-based activities and through adoption of Vannevar Bush's trails concept. The resulting pilot system has produced innovative solutions for the lifelong learner in terms of supporting their education choices and career decisions, providing tools to facilitate sharing experiences through the creation of individual timelines (see Figures 1-3). This process allows the learner to reflect upon their choices and decisions and supported meta-reflection. In addition the project integrated two JISC-funded tools (DELTA and ISIS) into the L4All pilot, as well as integrated the system with the Ufl Learndirect database. We have also worked collaboratively with external developers to produce an interactive, visual front-end tool for allowing learners and tutors to create learning pathways and annotate them.

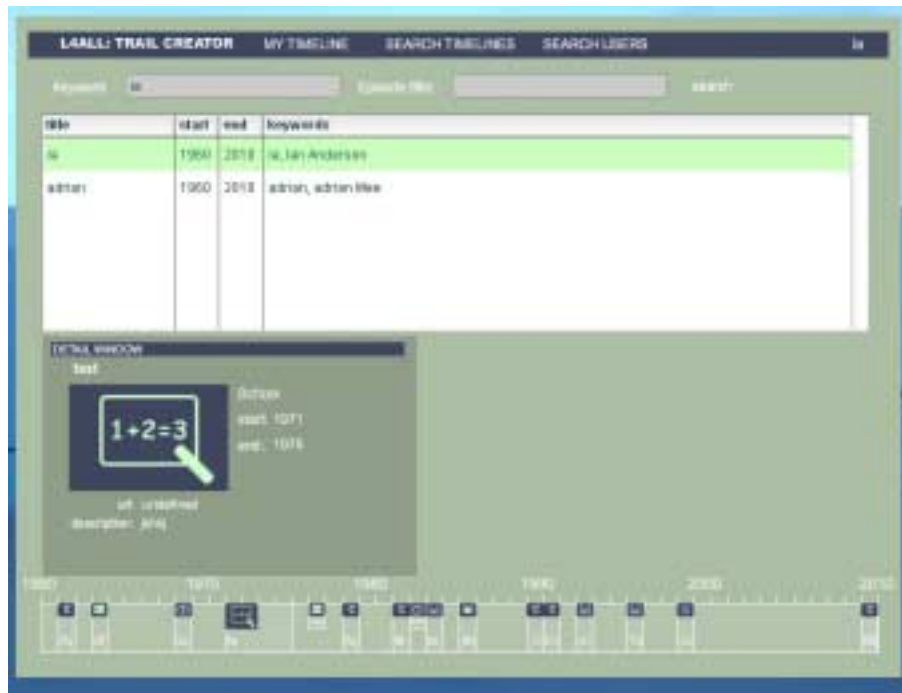


Figure 2. User interface for searching timelines of others



Figure 3. User interface for searching users with similar characteristics.

The evaluation studies have highlighted important issues about how the tool could be used in practice to support these learners. The studies suggest that the tool could be used in a number of ways: in group careers sessions facilitated by a careers specialist, in one-to-one sessions with a careers advisor, in personal tutorial sessions, collaboratively with one or more other learners, in a class-room session with a tutor, or over the Internet from home with parents, friends, over the Internet without assistance. The flexibility of the potential usage of the tool implies that the tool could be provided via college intranet or over the Internet. It would be desirable to have the information accessible via mobile devices as well.

The other aspect of the system identified by the evaluation and worth further development centres upon the collaborative and sharing functionality. The ability to search other users would be considerably extended by offering the opportunity for users to live chat with one another, supporting a

collaborative network of users and giving more support for those who are excluded from such opportunities due to disability or geographical location.

The main recommendation of the evaluation centred upon this and other additional functionality that may be added to the system to make it an even more engaging system. The suggestion by learners of including a journal as part of the system was particularly interesting. This could provide a good starting point for considering how the future e-portfolios aspect of the system could be integrated in version 3 of the L4AII system. The visualization of the timeline was particularly helpful for users implying that further resources and aspects of the system should be included based upon this design approach. Other added functionality, which was also requested in the first user studies, was to provide more information such as bus and train routes to the universities and colleges, information about open days and possibly taster courses. In this way it is thought that the resources area should be further developed using Flash animations to make them easily accessible to ESOL students and those with English reading difficulties. It would be useful therefore to conduct further evaluation in the continuation phase of the project in order to identify how this added functionality would be best integrated with the current system.

In addition to the noted project outputs, the project has also been successful in related academic outputs focussed on personalizing learning: Sara de Freitas & Chris Yapp: "Personalizing Learning in the 21<sup>st</sup> Century", published by Network Continuum Press, 2005, brings together position papers from a seminar held by the Lab Group in July 2005 at the Design Council and includes several papers from the JISC e-learning programme contributors, included the DEL Programme Manager Sarah Davies. Also, other work in the area of personalization developed over this period (see: Magoulas, 2005; Magoulas and Dimakopoulos, 2005) led to the publication of a book by George D. Magoulas & Sherry Y. Chen, entitled "Advances in Web-Based Education: Personalized Learning Environments" published by Information Science Publishing, 2006. The book covers a wide range of factors that influence the design, use and adoption of personalized learning environments.

As part of the dissemination of the project outputs, Dr de Freitas has worked with representatives from a number of the other Distributed e-Learning pilot projects from South England and we will be holding a joint final dissemination event at SOAS in London on 5th June 2006, the 'Lifelong learning for all: e-learning from concept to practice' conference ([www.gre.ac.uk/delconf/](http://www.gre.ac.uk/delconf/)). This will provide an opportunity for the projects to present and demo their systems to an audience of learners, stakeholders and the wider education community of practitioners and will be chaired by Dr de Freitas. Dr de Freitas and Dr Jill Jameson are also guest editors of a special issue of the British Journal of Educational Technology (BJET) on Collaborative e-support for lifelong learning (<http://www.blackwellpublishing.com/journal.asp?ref=0007-1013>). This special issue will include papers from the 'Lifelong learning for all: e-learning from concept to practice' conference including key outputs from the South England regional pilots.

The L4AII project is also building up additional resources to support lifelong learners and aims to cement the relationships with other Distributed e-learning (DEL) programme projects in order to disseminate findings to the wider community but also to integrate other DEL project outputs into the L4AII system.

## Outcomes

The project has achieved all of its stated aims and objectives: a Web Portal has been developed that allows learners to access information and resources registered with the portal by their providers, to plan their own learning pathways, and to maintain and reflect on their individual record their learning throughout life. Tutors are able to publish recommended pathways through courses and modules (which might be developed by a number of providers), thereby encouraging progression into HE. The L4AII system allows learners to share their learning plans and pathways with other learners (if they wish) in order to encourage collaborative learning and collaborative formulation of future learning goals and aspirations.

The methodology we have adopted in developing the L4AII pilot has enabled a significant input into the development of the system from major stakeholders throughout the lifetime of the project (learners, instructors, institutions and others). We believe that this methodology is also one of the major achievements of the project, and we plan to adopt it again in the L4AII continuation project and

beyond. Hosting the L4A// project at the London Knowledge Lab has allowed this approach to be readily employed, due to the broad base of multi-disciplinary in-house expertise and the Lab's extensive links (either directly or via its parent Birkbeck College and Institute of Education institutions) with schools, FE colleges, and other FE/HE stakeholders.

In addition, the London Knowledge Lab is committed to sustaining and supporting the L4A// system and this support extends to our involvement with the Lifelong Learning Network bid submitted to HEFCE. With shared concerns about widening participation, social inclusion, supporting underserved learners and the use of innovation to find solutions to key challenges, the team and the institutions see the value of working collaboratively towards the same aims and objectives. Moreover, the ongoing commitment of Birkbeck to the development of the system is evidenced by funding secured through the Birkbeck e-learning advisory group. This has allowed us to purchase and deploy a dedicated server for the L4A// system which ensures its sustainability as a service for lifelong learners beyond the end of the project. The impact of L4A// upon the wider learning community is therefore assured. The Birkbeck-led Lifelong Learning bid also includes support for the further enhancement and broader deployment of the L4A// pilot in the longer term.

The value of the project is not only in terms of the service provided by the L4A// system for supporting lifelong learners' career and educational choices, but also as a proof-of-concept of the trails approach. In particular we have found that the trails concept that has underpinned the project provides a helpful approach for those involved in developing user-centred systems, especially when used in conjunction with usage scenarios.

The impact of the lessons learnt from the project will be disseminated further to the wider community of practitioners and researchers through two planned journal articles, one intended for submission to the British Journal for Educational Technology (BJET) Special Issue on 'Collaborative e-Support for Lifelong Learners' and the other intended for submission to a software development journal. In particular we are interested in sharing information with the community relating to the theory-based approach to design whereby we have used the trail concept to model user behaviour and inform system designs. It is expected that other researchers, technical developers and practitioners may benefit from these outcomes. In particular, we aim to target practitioners attending the Lifelong Learning conference in June 2006, and the L4A// system will be demonstrated in order to inform practitioners about the system and the user-centred approach to its development that we have used.

The main project outcome is the development of the L4A// pilot system. This system has been developed successfully and as a key output of the project will be rolled out to partners and wider stakeholder communities at the earliest stage. For example, discussions are underway with UCAS as to whether the system may be further developed and integrated with their stakeholder community. This opportunity would benefit a very wide audience of lifelong learners through open access to learners at the critical stages of their development, helping them to make informed educational choices and career decisions. Similarly, the Birkbeck-led Lifelong Learning Network will allow access to a wide consortium London colleges and universities and will provide a good opportunity both for roll out of the current system and for the further development of tools, toolkits and services to support the lifelong learner.

Lastly, the L4A// pilot is not only a valuable resource for learners taking non-traditional pathways into Higher Education, but has also served as a test bed of cross-institutional access management, enabling an analysis of the adoption of Shibboleth by a number of London institutions.

## Conclusions

A key conclusion of the project centres upon the overall approach taken by the project team, such as the use of the *trails* concept and the adoption of a user-centred approach to development. The provision of a system based specifically upon usage scenarios has proved popular with its intended users, and the evaluation has indicated that the trails concept underpinning the L4A// system is extremely effective in practice. The project advisory group have also indicated that the system is much more usable and user-friendly than other existing systems in the area and that there is strong indication that the tool will help learners to reflect more deeply upon their learning choices and career decisions.

Developing the L4A// pilot has proven a challenging task, primarily because of the high heterogeneity of the different services that had to be integrated. In some cases, it was necessary to extend the external service in order to cover the full L4A// requirements (DELTA) or to write mapping code in order to translate metadata between our system and that supported by the external service (ISIS). There were also cases where it was technically not feasible to integrate a service as originally planned (VMAP, OpenMentor) and where we had to develop our own extension to replace the missing functionality. The choice of the Flash platform to replace the visual front-end that was to have been provided by VMAP added extra heterogeneity into the system necessitating the creation of a special call interface that Flash could interact with.

The primary finding of the evaluation was the endorsement of the project concept. There was agreement across all the user groups testing the system of the value of this work, and its potential to support otherwise excluded groups of learners. It is particularly interesting to note the particularly positive response from the FE learners, which suggests that this might be a particularly appropriate group to focus further development work around.

The study has also been useful in identifying areas of further technical refinement and development that are required. Although the tool has potential, there is still work that needs to be done before it would be plausible to offer this as a service, although the beta testing version of the tool may be available online as part of the formative user evaluation. Additional functionality has also been identified that would be a valuable addition to future version of the system, such as links to e-portfolios and/or journals.

Opportunities have also been identified for interesting work with the system, once completed. For example, the possibilities for using this tool in different ways could be explored (e.g. individual use, use in formal education with an adviser or tutor, integration of this with existing services such as UCAS, etc). Another interesting observation was the way in which visualization of learning and work prompted users to re-think their own identity as a learner (and potential employee). The long-term impact of such changes in perception on participation would be worth pursuing with longitudinal studies, possibly in the form of case analyses.

Through the evaluation of the pilot system, the L4A// project has served as a catalyst for new approaches to engaging the interest of lifelong learners, developing their trust in carrying out e-learning and web-based activities, and encouraging them to take responsibility for planning and managing their own lifelong learning and continued professional development. In this vein, the L4A// pilot provides a unique opportunity for a culturally diverse London to plan, initiate and execute a set of initiatives aimed at promoting equal opportunities, enhancing quality, accessibility and efficiency, and ensuring that new technological developments of previous JISC projects remove existing barriers and provide widening participation for all of London's learners

There are further improvements that can be made to the system in the future: replace the Flash interface with an open-source interface that will provide better robustness, portability and extensibility; collect more information from experts in order to improve the automatic generation of sequences of courses; create an enhanced user management system that will include user groups and more advanced security rules; and integrate this with a security management system such as Shibboleth.

## **Implications**

Plans for the longer-term extension of the L4A// pilot will aim to include a broader range of FE and HE institutions, and have links to work-based learning environments and via the Connexions gateway. We are already in discussion with Aim Higher, UCAS, Prospects, Connexions, Ufl LearnDirect and the Lifelong Learning Network to find new and effective ways of embedding L4A// into more generalised contexts of use. The continuation period of the project for example will aim to support HE/FE communities of learners through integration into college Intranet and Internet systems, as well as through existing systems such as the UCAS web site.

The longer-term implications for the user groups targeted by the system will be a suite of tools, toolkits and services that provide integrated services via college portal systems and over the Internet. Alongside these tools and services, we aim to support user communities through the availability and link up with collaborative possibilities (e.g. live chat and support of online communities). Working with

the major stakeholders, the development of more joined-up end-to-end services will allow learners to more easily make educational choices and career decisions allowing them to experience a seamless movement from school to FE to HE and onto work. This will deliver a qualitative improvement to the learner and help to put their needs at the centre of the process of education and career development.

By working closely with the major stakeholders, the work conducted to date will be used to support learners in a range of different contexts e.g. Connexions centres, via UCAS, via college and university portals and over the Internet. This wider roll out to prospective and current learners will engender widening participation particularly to those who have a restricted perception about what they can achieve in practice through learning and work opportunities.

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All public project documentation can be found at the L4A// project web pages at: [www.lkl.ac.uk/research/l4a//](http://www.lkl.ac.uk/research/l4a//).