

# BRIDGING THE DIVIDE: DEVELOPING INTEROPERABLE LEARNER RECORD SYSTEMS

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## Abstract

*This paper describes the progress made by the SHELL Project, a partnership between further (FE) and higher education (HE) institutions. During the period 2002-2005, the SHELL Project developed shared business processes between partner institutions, and transferred student record data electronically between partners using XML.*

*A learner record database was created to bring together and store details of qualifications achieved in a range of institution for each learner. Access to these learner records was achieved by the creation of a web based portal. The experiences of this project and implications for future developments are discussed.*

## Keywords

SHELL Project, Interoperability, Learner Record

## 1. Introduction to the SHELL Project

The SHELL project is one of two projects funded by the UK Joint Information Systems Committee (JISC) in the first phase of the Managed Learning Environments for Lifelong Learning programme [1]. The key aim of this programme was to support the mobility of learners via integrated information systems and the concept of a single point of access to a range of integrated learner resources.

The SHELL project [2] ran from 2002 to April 2005, and was led by the University of Plymouth, in partnership with (initially) four local further education colleges. A phased approach meant that by the end of the project, the University was working with five further education colleges and three schools in the South West of England.

The project originally arose out of an identified need to support students undertaking higher education courses delivered by further education colleges in partnership with the University. There were persuasive reasons for developing the support in this area.

Each year over 4000 students register at partnership colleges, studying for qualifications that are awarded by the University. 'Double registration', the processing of registration data by a college and independently by the University, takes weeks to complete and is prone to error at both ends. Complete reconciliation of the data on college and University student record system takes months. To the student, this double registration process sometimes means having to fill in two registration forms.

It was clear that current administrative processes could be developed and improved and this was a major driver. Furthermore, provision of rapid access to the University learner management system (LMS) was attractive to a target group that is well dispersed around the region.

At the start of the project, participating institutions relied on a range of student record systems, none of which were using interoperability standards for data transactions. In fact, existing transactions of student data between institutions were often conducted using paper based systems.

The project aimed to:

- Improve administration through single registration for all partnership students, combined with rapid transfer of registration data between institutions. (This aimed to cut administrative workloads and improve the co-ordination between delivery and awarding institutions.)
- Improve frameworks for integrating the student record and information systems between partnership colleges and the University. (In practical terms, from the learner point of view, this aimed to cut the waiting time from the point of initial registration to where access to the LMS was granted.)
- Develop a personal web-based portal for learners. (This aimed to provide an independent record of qualifications that would be available to learners long after they left their place of study.)

To meet these key objectives, the SHELL project developed an infrastructure based on IMS standards [3] to transfer data, coupled with revised business processes for handling data between partners.

Part of the aim of the programme under which this project was funded was to identify issues relating to the development of such an infrastructure. The aim of this paper is to identify and discuss the key issues that arose during the course of this project.

## 2. Transferring Data between Partners

The project aimed to transfer and store data using XML. Although the project intended to retain a full time technical team leader, recruitment proved to be difficult and technical development was eventually shared by a number of small companies and supported by institutional staff. Larger companies (such as suppliers of student record systems) showed initial interest but did not participate to any great extent as the project proceeded. Some potential reasons for this lack of response are discussed later.

In partner institutions, technical administrative personnel were typically highly conversant with their record systems and able to output data in a range of ways. Unfortunately, such familiarity did not in all cases extend to the use of IMS standards.

One institution produced an XML output data stream from its student record system; other institutions took advantage of an alternative comma separated value (CSV) file format. The locally-developed data stream ('plug-in') links to a device known as an ioAgent [4] supplied by the project centrally. This takes the supplied CSV output and converts it to XML for onward transmission and storage.

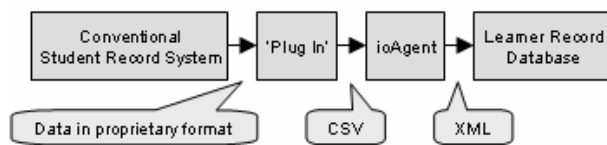


Figure 1: early stages of data transaction

Figure 1 depicts the typical arrangement, showing the early stages of data transaction. The centrally-provided ioAgent means that project partners can choose to develop a 'plug in' to their system, a comparatively more straightforward task without needing the specialist knowledge of XML, opening up connection possibilities to a much wider range of data sources. This approach is both sustainable and scalable, with the advantage of catering for a range of legacy systems.

The ioAgent transforms data based on the IMS Learner Information Package (LIP) specification, soon to be defined in terms of a British Standard (BS 8788) [5].

A common standard is required if data is to be shared more widely, and this infrastructure was required to underpin the third project objective: to make records of study and achievement available to learners on a long term basis.

After encoding student data into XML format, learner data is then passed to the 'Hub', which acts as a message exchange centre. As can be seen in Figure 2, the Hub can potentially receive and transmit data from and to a range of sources including exam boards, schools, colleges and personal development planning (PDP) systems.

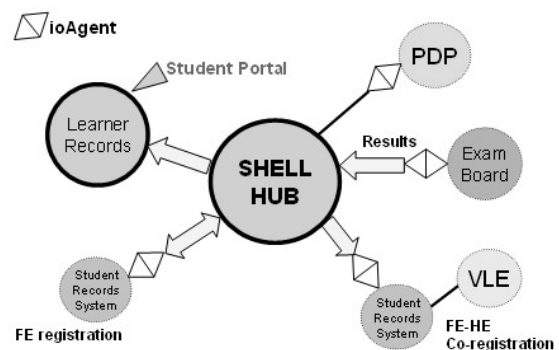


Figure 2: transacting data across a range of partners

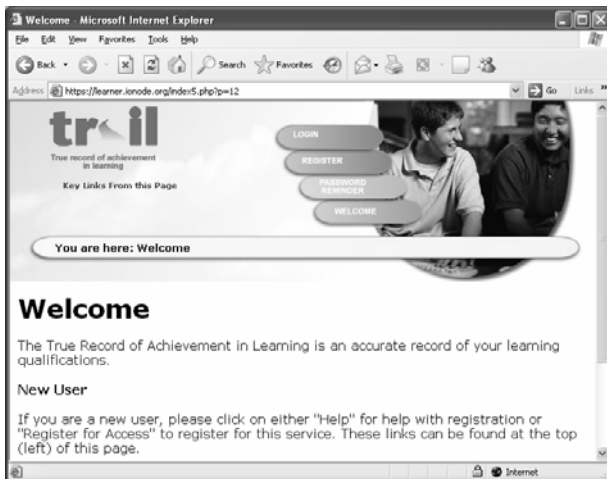
Longer term access to learner records is provided by a 'learner record database'. The learner record database receives data from transactions passed through the message exchange centre (the 'Hub'). The storage of this student data underpinned the development of a web based portal, providing long term access to the learner's records. This comprises records amalgamated from the range of participating institutions attended by the learner.

## 3. The Learner Record Portal

The 'Learner Record' is a multi-institutional dataset based on information contributed by all institutions in the partnership. It currently includes details of qualifications and modules from courses completed and those in progress, and provides functionality to save, print and to grant access to others.

Access to these records is via a portal, currently deployed on a standalone web site with web-service links to the learner record database. Links would be possible from college and university websites, and other popular websites that aim to support the student experience in order to help raise the prominence of the learner record facility.

The learner record portal is complemented by an administrative portal, providing access to authorised staff for the purpose of database maintenance. As we shall see, issues of shared management of the learner record database proved to be significant.



**Figure 3: the learner record portal ‘home’ page**

Figure 3 shows the learner record portal home page, providing access to more detailed qualification records (see Figure 4). New users self-register, and are asked a series of questions relating to their period of study, together with a ‘security question’ previously selected. We shall return to the theme of security later.

**Qualification Summary**  
Click (i) for full details of your qualification

	Start Date	Place of study	Qualification Title	Qualification Result	Date of Award	Awarding Body
(i)	26.09.2003	University of Plymouth	BA (Hons) in Business Administration	In Progress	Pending	University of Plymouth
(i)	12.09.2000	Cornwall College	GNVQ Marine Sciences	Achieved	12.06.2002	BTEC
(i)	11.09.1999	North Devon College	GCE AS Level General Studies	Achieved	11.06.2000	EDEXCEL

**Figure 4: sample display of qualification data**

Specifications for both learner record and administrative portals are publicly available, together with other specifications and business process agreements drawn up by the project [6].

## 4. Key Issues

From the outset, the project aimed to establish and agree on the scope and range of learner information to be collated and shared. This involved drawing together different systems across different education institutions, each funded by different agencies with dissimilar data and reporting requirements. As might have been predicted, a number of issues arose during the lifetime of this project, and the key barriers to progress are discussed below.

### 4.1 Impact on participating institutions

A substantial amount of time was required to negotiate between partners in order to draw up and agree shared business processes. Deciding the range of data to be

transferred proved also to be problematic. It was a reasonably straightforward process to identify the data required by the upstream partner institution and build this into the specification. It was less clear as to what other data should be shared and stored for the ultimate benefit of learners, and this part of the project proved to be one of the greater challenges.

One issue revolved around the granularity of the existing record systems in the partnership. Some record systems stored results at the level of the programme, rather than at the level of the module. Consequently, some institutions were required to start recording student data at module level and this represented no small task for these partners.

### 4.2 Good technical support is essential

Earlier, we alluded to the issue of technical support. It was originally intended that student record system suppliers would produce an IMS interface between their systems and the Hub. In practice, none of the suppliers involved with the project did this, due possibly to the lack of clear benefits from their point of view. This left technical work to be carried out within the project.

The involvement of a number of small companies, following the difficulties encountered in recruiting a suitable technical team leader, brought additional issues of co-ordination and the need for close supervision. However, it also brought in some of the vision that led to the development of a flexible open-source system for the transfer and storage of data using IMS [4]. In the event, development was much later than planned and this subsequently had an adverse affect on the project.

Issues of technical support were also present at the institutional level, where a limited number of key personnel were conversant with the ‘nuts and bolts’ of the individual record systems. This was particularly the case with smaller institutions, and these people were often fully committed with a significant number of competing demands on their time.

However, the concept of the ‘two stage’ data conversion via CSV to XML format (see Figure 1) proved to be a worthwhile solution, despite the apparent complexity at first sight. Where one partner opted to develop their own ‘plug-in’ to output student records directly in XML, this proved to be a task requiring substantial effort at a local level, a model that is clearly not scaleable.

### 4.3 Lack of a Unique Identifier

From the start of the project it was acknowledged that a key issue would relate to the need for (and lack of) a unique identifier number for students. Each of the participating institutions maintained a reference number that was unique to them, but in the context of a lifelong shared learner record this is not ideal.

During the lifetime of the project, the issue of a lifelong learner number was subject to consultation [7], but responses to this were at best equivocal. For example, NIACE [8] agreed that a unique number would provide a range of largely indirect benefits, suggesting that existing reference numbers could be employed, such as those used by the National Health Service. EEF [9] agreed that a unique number would contribute to *“efficient delivery and management of learning across the complete delivery spectrum”* taking the view that the use of the UK national insurance number would be *“strongly recommended”*. Unfortunately both of these approaches could rule out a large number of participants (such as international students) and at a national level, this issue remains unresolved.

It was acknowledged that each institution would have its own student identifier, and provision was made in the SHELL database to record and use all the associated identifiers.

#### 4.4 The issue of duplicates

The identification and processing of duplicates presents a challenge, particularly so given the lack of a unique learner number. Part of the problem lies in the way that new records are generated. For example, one participating institution creates a new record when a student enquires about a course, allowing follow up for marketing purposes. More typically, other institutions only create new student records at the time of enrolment.

The administrative cost of dealing with potential duplicates is not trivial, and is associated with other subsequent effects. For example, one partner institution reported that the return of registration numbers had *“not been as timely as hoped, due to the amount of time that potential duplicates take to sort out”*. This delayed student access to the LMS.

But whose responsibility is this? In the absence of a central ‘data controller’ or co-ordinating agency, who will take responsibility for maintaining accurate records? It is clear that any system accumulating shared records must have an integral and robust method of identifying and processing duplicate learner records. For national rollout, this translates to a strong imperative for an adequately resourced central administration agency.

#### 4.5 Security and Authentication

Users that are new to the learner record portal must be securely identified prior to being granted access to stored records. The transaction process means that a new learner record is generated after the data has been entered by the registry offices. This delay causes a number of problems, especially for the learner who signs up for a short course (see Section 4.6). Under these circumstances, how can login credentials be passed to the new user?

For these reasons, it was decided to use a combination of personal data and a security question (collected at the time of registration) to implement a registration ‘challenge’. By creating the potential for ‘self-registration’, this obviated the need to make contact with learners to provide them with login credentials.

In spite of these security measures, at least one of the partner institutions remained concerned that data was potentially at risk using this approach. Even if self-registration proves over time to be sufficient, there will be a clear need for a supporting agency to deal with issues of missing/incomplete data and problems as simple as a lost username/password combination. Such an agency would need to be centrally resourced, as individual institutions are likely to be unwilling to bear the costs of dealing with learners after they have left.

#### 4.6 Short courses are problematic

NIACE, in response to the request for consultation on the unique learner number suggested that *“will make it possible to collect and record the ‘untidy’ patterns of participation adopted by many adults who get involved in short episodes of (mainly part-time) learning”* [8]. Maybe so, but our experience indicates that it is the short courses that are the hardest to capture. One partner remarked that *“many of our students study remotely and are gone before their enrolment is input into the system”*. Increasing the administrative burden of managing short courses is unlikely to prove popular at an institutional level. Records of short or informal courses will be more difficult to incorporate. If the learner record is to be complete and inclusive, realistic provision for short courses is needed.

#### 4.7 Who benefits from integrated systems?

Projects such as these set out to improve the experience of the learner. Unfortunately, institutions tend to view the advantages of integrated data transaction from a different perspective. Will the developments supporting the learner prevail (the learner record), or those supporting the institution (revised business processes)? It will be interesting to see which aspects stand the test of time after project funding ceases. There are already indications that project initiatives supporting business processes are already *“well embedded into the normal running”* of at least one partner. Will this be so for the learner record?

This issue of ‘payoff’ is also valid at the inter-institutional level, where partners might question how they benefit in the short term. For example, in business terms, the sharing of data is of primary use to the next institution in the ‘chain’, with little or no benefit to the current or previous delivery institution. Somewhat reminiscent of a modern day ‘tragedy of the commons’ [10], such benefits can only become visibly apparent when there is sufficient ‘critical mass’, with institutions able to receive data from other sources efficiently as well as transact it forwards.

#### 4.8 Administrative or academic rewards?

Although this project aimed to support the experience of the learner, it was surprising to see how little attention was paid by academic staff in general. For example, despite advertising, very few academic staff attended project roadshows. Evaluation suggested that academic staff tended to view the project as one that primarily supported business processes.

It was our experience that there were strong and sometimes conflicting views on the range of data that ought to be stored in the learner record. Reaching agreement on the details of qualifications to be stored was incredibly time consuming. Reaching agreement on the scope of a wider learner record proved to be insurmountable within the scope of this project, due to the range of wider skills and competencies that could be recorded. Any system which purports to meet a range of learner needs faces a strong challenge in this area.

Very often, individual academic departments are at very different stages of development with regard to electronic recording of learner data. It is also arguable that administrative and central teams are generally more open to ideas of standardisation.

However, it is in the area of administrative processes where immediate and tangible benefits are perhaps most readily visible. Apart from modularisation, local impact includes making modifications to enrolment forms and other documentation. In this respect, the project has thrown clear focus on shortcomings in the existing systems, felt most strongly by the partner college who felt that their experience of participating had ultimately "*improved data integrity*".

#### 5. Concluding remarks

The concept of a lifelong learner record is powerful, potentially enabling learners to access a record of their development in the widest sense, irrespective of the life choices and pathways taken. Although limited to qualifications at present, the architecture developed by the SHELL project will facilitate the future storage of other records of achievement, such as personal development records and planning. We believe that the technical architecture developed by this project will enable all manner of legacy systems to be integrated to the potential benefit of lifelong learners.

In the UK, other projects are now commencing with funding to take the idea of the shared learner record forward. These projects are focusing on both lateral extension (to other parts of the United Kingdom) and vertical extension (to include other data sources/sinks).

Subsequent projects might consider how to make this record of lifelong learning inclusive, rather than

exclusive. For example, relatively little work has been undertaken to investigate the implications for those possessing other qualifications (such as those gained overseas) that do not map to current schemas for learner record data. We would also suggest that a substantial further focus is needed on the issue of 'what learners want' from such a system.

In conclusion, as Charlesworth (2004) notes, the purpose and functions of a national lifelong learner record system "currently remain unfocused" [11]. The shift from regional pilot to national facility represents a significant divide yet to be bridged.

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