Interactive Logbook: a Mobile Portfolio and Personal Development Planning Tool

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1 Abstract

Interactive Logbook is an integrated Personal Learning Environment (PLE) for use in both formal and informal settings. The metaphor of a multimedia logbook describes its functionality and simplicity.

The PLE brings together all the tools and networked resources required by the learner. Running on the learner's PC it helps the user to plan, manage, track and review their learning activity. The Logbook is essentially a shell application with plug in support for any local or networked tool. Example plug-ins include: word processor; email client; virtual learning environment (VLE); internet messaging; weblog aggregator.

The system keeps a record of the user's activities, which the student can then review as a personal learning diary, or revise and present as a portfolio of achievement, where evidence of learning can be mapped to a Personal Development Plan (PDP).

For the mobile learner, three features are key: offline access to online resources when out of network range; Tablet PC enhancements for note-taking; a mobile phone client for when access to a PC is impossible or inappropriate.

The phone client is a 'helper' application, allowing the user to continue making log entries wherever they are, whilst accessing a subset of the networked resources such as email, calendar and news feeds.

This paper describes the technical, human and institutional challenges encountered in trying to develop an open source consolidated learning environment in the emerging ePorfolio and ePDP field. It also discusses findings from user trials and future challenges including how to mine and present the data contained in the log.

2 Keywords:

Mobile; Personal Learning Environment; PDP; Portfolio

3 Introduction

As the range of digital resources and communications methods for learning increase, students are finding it harder to manage this information. What is required is a form of personal learning organiser or Personal Learning Environment. (Corlett et al. 2005) A PLE offers pedagogical as well as administrative benefits to the learner, as described below.

We propose the architecture for a PLE system with particular emphasis on its benefits for creating portfolios of learning and planning one's personal development. To fulfil the

requirements for such a system, we believe a combination of personal and mobile technologies are required as set out in this paper.

Last year we presented the Interactive Logbook as a student design project in which a team of undergraduate Engineering students developed a personal learning environment (PLE) for students, to support rich collaborative interactions through a Tablet PC interface. (Kiddie et al, 2004).

Since then, the Interactive Logbook has been redeveloped as an open source project and has taken on a new focus. The Joint Information Systems Committee in the UK has funded development work on the Interactive Logbook under the Distributed eLearning Tools programme (JISC, 2005) with the aim of making it available free of charge to all Higher Education (HE) institutions in the UK. The priorities for this round of development have included creating a robust and scaleable architecture, supporting learners across multiple institutions and over time, and providing for ePortfolio and ePDP activities.

The software developed to date has been evaluated for usability and technical quality. The outcomes of the testing are described and discussed in this paper, together with future plans for in-depth pedagogical evaluation.

4 Personal Learning Environments, ePortfolios and ePDPs

4.1 Personal learning environments

For all the benefits of a well-run institutional Virtual or Managed Learning Environments (VLE and MLE), there are a number of significant shortcomings with respect to their value to the individual. First, they are not intrinsically *learner-centred*. Courses are largely created and structured around the curriculum and administrative organisation of the institution, which leaves little freedom for involvement in the design by the learner. A PLE is structured by the learner, for the learner.

Second, *individualisation* is weak. Although the learner will see their own selection of courses and may be able to make some graphical modifications (mostly in the interest of accessibility), there is little scope to choose a personal suite of tools or resources according to individual learning styles and work habits. A PLE contains the tools of the learner's choice and resources as chosen and managed by the learner.

Third, VLEs and MLEs offer *collaboration* tools (discussion, chat, whiteboard) but these are only available to members of the course and often only for the purpose of the course. Our previous research (Corlett and Sharples, 2004) has shown that students are much more flexible and informal in their approach to collaboration, with many work-based discussions taking place in social spaces and vice versa. They also want to determine who they communicate with and how, and may not want all their exchanges to be visible to a course tutor. A PLE should ensure that a variety of communication tools are available to the learner, and that he or she can choose with whom they communicate, and who is privy to this. A wider variety of collaboration means should also be available, including electronic support for face to face sessions as well as entirely online ones.

Fourth, technology needs to be *situated* (Jonassen and Land *eds*, 2000). In order to practice real-world situations, learners need to be in real-world situations. This means that the learning environment also needs to be present and appropriate to the situation. In many cases, a live connection to the internet is not possible (in various laboratories, work places, social environments etc.), and without an offline client to the VLE, there can be no electronic interaction. Even though most mobile phones can provide data services, these are still prohibitively expensive. Wireless networks (WLAN) are still not widely available or economic. Again, a PLE should overcome this problem.

Fifth, learning happens everywhere and at all times. A VLE or MLE cannot be *ubiquitous*. A single thought or conversation can be a learning experience and it is important that ad-hoc, informal experiences as well as planned or formal ones are supported and recorded. Even where a connection to the Internet is possible, the design of most institutional systems prohibits quick, simple interactions. First, generally a full-size browser client (PC or similar) is required, with internet connection. Then the user must log in and select a specific course, then take part in some structured activity. This also presumes that there is a relevant part of the VLE for the experience that is taking place. A PLE must provide appropriate services, information and connectivity at all times and in all places.

Finally, a PLE must support *Lifelong Learning*. This requires support over time, amongst institutions, and through a variety of technologies (Gemmell *et al.* 2004). Learning habits are changing. It is not unusual for learners to be studying at more than one institution at a time, often whilst also engaged in work. A PLE should provide access to all relevant electronic resources, at all times and without logging on to multiple web sites, email accounts etc. These resources should also be available when the learning episode is formally finished, for reflection and revision purposes.

VLEs and MLEs are still a very important part of the learning experience within institutions, but should be seen as only appropriate to certain times, places, interactions and learning experiences. From the learner's perspective they are not the complete solution and require a form of portal, a 'glue' to coordinate and manage the rich mix of electronic resources relevant to learning. See (Divitini *et al.* 2005) on systems to support multiple social structures and multiple interactions for learning.

4.2 ePortfolios and ePDPs

In the UK there is a strategic drive to introduce Progress Files in the HE sector. The purpose of these is manifold, including "to contribute to an individual's lifelong record of learning and achievement" and "to support the process of personal development planning" (QAA, 2000). It was recognised going into the current round of development that these are areas in which the Interactive Logbook can make a significant contribution.

To address this agenda, Universities are increasingly turning to electronic solutions that will help the students to keep portfolios which can be monitored by the institution. The JISC is funding a number of such developments and more are being developed commercially. Valuable though these are, their approach generally introduces barriers to the learner gaining from their full potential.

Not least of these barriers is ownership. To be of value as a reflective and planning tool the learner needs to be able to record his or her complete learning journey. Something owned by an institution, that is only available for a period of time and which requires a web-based log-on will fail to capture learning taking place elsewhere, at other times and of an informal nature. Even that which is related to the course will be filtered by the learner to present a favourable view.

The Interactive Logbook seeks to provide a place in which personal information can be stored completely, privately and for all time. By being integrated with the environment in which much of the learner's activity takes place, physical time and effort barriers can also be reduced, made even lower by automated logging of basic documents and events (emails, documents, diary entries,…).

Institutional portfolio systems are valuable in helping the learner to reflect in partnership with their tutor or learning mentor and as an official record of learning at the institution. To this end, it is important that a personal portfolio tool is capable of import/export of a selection from the full portfolio.

5 Scope and Design of Interactive Logbook

5.1 The metaphor

The metaphor of the Interactive Logbook was conceived from the very traditional personal learning environment – a logbook, kept by students to record lectures, laboratories, project notes and more besides. Although in many subjects, especially in the science disciplines, logbooks are still an integral part of courses, they are not well used by students. Since many learning activities are taking place digitally: writing essays, analysing data, browsing the web, online discussions - it doesn't make sense to print or copy out the output for a paper-based logbook. Although the IL extends to network capability and digital search, the name 'logbook' gives an impression of the flexibility and purpose of the tool, and was behind the initial choice of delivery platform: the Tablet PC.

5.2 Chosen hardware and platforms

Two platforms were chosen for the Interactive Logbook's implementation. First is the PC. Written in .NET, the application runs on recent versions of Microsoft Windows ®. In particular, enhancements are included for the Tablet PC edition. Although market share of this platform is still relatively low, it is increasing and offers interaction closest to that of a 'real' logbook. Desktop and laptop devices are also supported and account for the largest part of ownership amongst learners.

To offer nearer ubiquity of access, it was decided to also create a mobile phone implementation. As of 2003, 90% of young adults owned a mobile phone and 75% in the general adult population (National Statistics, 2003). Although the scope of applications for a mobile phone client is much smaller, it is well suited to short data, such as instant messaging, text messaging, calendar, email, news and other sources already frequently used in the learning process. A mobile phone also makes an excellent device with which to make short log entries, it being present on more occasions when the learner is engaged in learning. To ensure widest possible uptake, including PDAs, a mobile Java (J2ME) platform was chosen.

5.3 Avoiding duplication

Although many of the emerging specifications for the logbook include applications already widely in use (word processor, spreadsheet, email client,…) , it is not the intention of the Interactive Logbook to replicate functionality where it can be provided by an existing best-of-breed tool, or at least one that the user has already chosen to invest in. Instead, the IL uses a plug-in architecture that allows applications already available to the user to 'plug-in' to the interface, bringing their full functionality into the integrated environment.

5,4 Networked services

One aim of the Interactive Logbook is to present the user with their networked resources (email, VLE, discussion forums, web pages, web logs, news,…) in one place, and to offer offline synchronisation. For email, the standard protocols of POP and SMTP are utilised. Web-based content at its most simple can be represented by a cache of web pages on the users device. However, standards and transport mechanisms such as RSS and SOAP allow for a richer set of interactions, including aggregation and filtering of information. Although systems that support SOAP are still few, an increasing number of commercial VLEs and other institutional systems are embracing this new technology.

5.5 Logging and goal-setting

The learning log and goal planner are at the heart of the IL and is the most novel element of the application. A goal-setting tool exists to help the learner structure and plan their learning aims. A hierarchical layout allows the learner to break down their learning goals to a level of granularity that best serves their purpose. For those who are unfamiliar with detailed progress planning, institutions may offer a provisional plan of assessments, milestones,

competencies or other targets relating to a course. The user can integrate this into their personal targets and modify as appropriate.

Log entries can be made by the user at any time. Each of the plug-in tools provides a 'Log This' button. A log entry can be filled with as much detail as desired by the user. Data fields include 'title', 'date / time', 'keywords', 'comments' 'links' (to URLs or local files) and 'comments'. Some of these fields are pre-filled based on the current file or activity. The user can also choose for other triggers to create log entries, for example the arrival of an email, each new web page visited, or on saving a new document. Log entries may also be made to record ideas independent of a particular activity or document.

Additionally, each log entry can be linked to one or more targets. This helps the learner to organise their portfolio whilst also keeping track of progress against their pre-determined goals.

Since no existing tools are available to meet these requirements, a special plug-in has been developed to search, filter, view and manage log and target entries. Should a better application become available in the future, the architecture would allow the existing tool to be 'plugged-out' and a new one plugged-in in its place.

Because of the potential size and complexity of a portfolio, it was decided to only implement the full management tool on the PC. The mobile phone client allows for the creation of log entries only.

6 System Architecture and Specification

6.1 PC application

The PC application plays host to the following plug-ins at present, at the selection of the user:

- Generic web browser
- Generic diary/organiser
- Generic (ink) notepad
- Generic POP 3 email client
- GMail RSS email client
- Generic file manager
- Bespoke log/target manager

- SharePoint Portal client
- MSN Messenger*
- Microsoft Word*
- Microsoft Excel*
- Microsoft Outlook*
- Microsoft PowerPoint*
- Star Office*

* subject to existing licensed installation on user's computer

Selected elements of the log and target may be exported in a variety of human and machine-readable formats. A HTML export can be used to view plans and achievements, or as the starting point for a CV when opened in a word processor. A basic XML export allows the user to take their complete log with them to another IL-enabled machine. An IMS LIP (IMS, 2001) formatted XML document should ensure that data can be imported into a variety of VLEs and ePortfolio/ePDP systems.
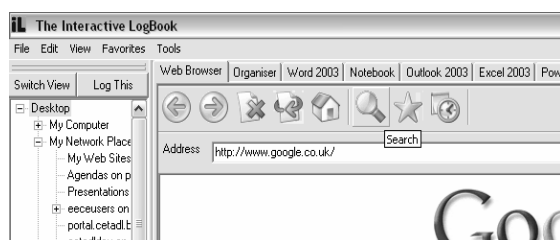
Figure 1 : Interactive Logbook with application selection tabs, web browser and file browser visible
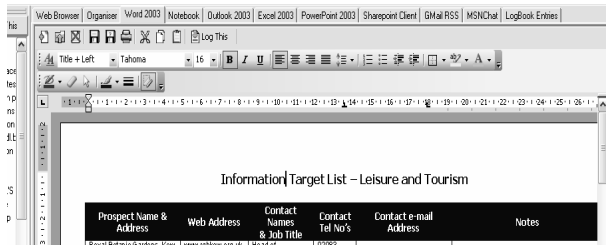

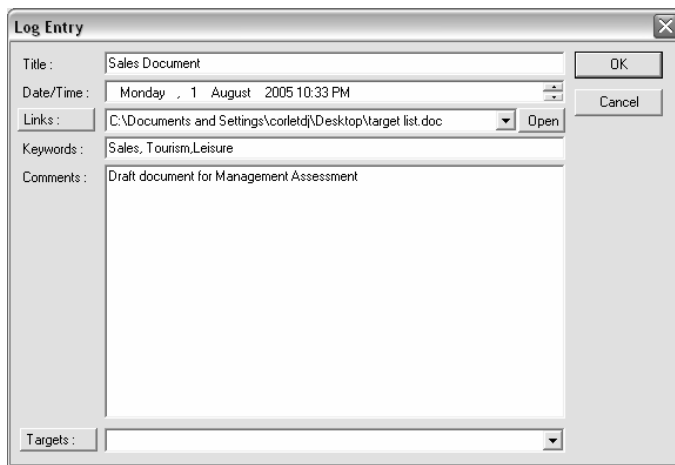*Figure 2 : Interactive Logbook with Microsoft Word ® plug-in*

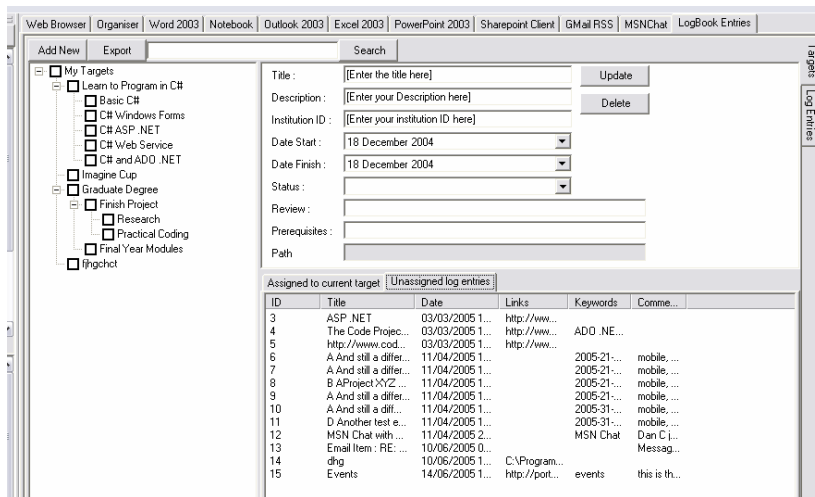
Figure 3 : Interactive Logbook log entry dialogue

Figure 4 : Interactive Logbook Log and Target management tool

6.2 Mobile phone application

The mobile phone application allows the user to configure a range of tools as shipped with the IL or as provided by an institution. The standard installation includes POP/SMTP email client, RSS news reader, generic calendar application. Log entries can be created from

within each of these applications or as a simple memo to self. The Logbook can be synchronised as determined by the user so as to give full control of the data exchange (and hence cost) to the user. On synchronisation, new log entries are sent as an email attachment to any predetermined email account. If the PC IL is configured to collect from this email account, it will recognise the attachment on receipt and open them in the log/target manager on next use.

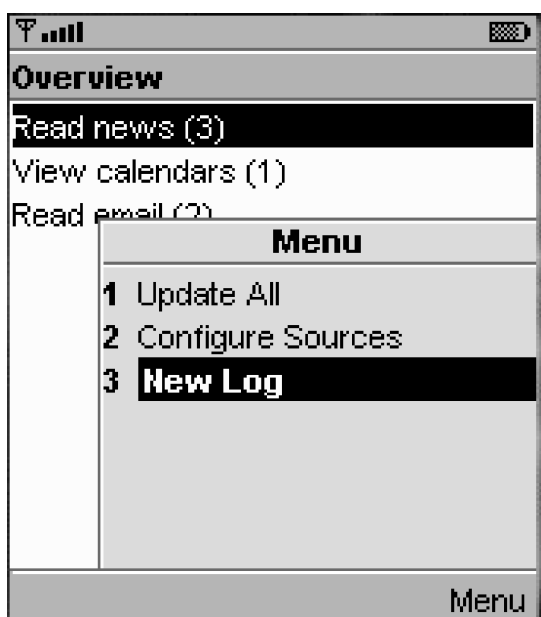*Figure 5 : Interactive Logbook mobile phone client*

Figure 6 : Interactive Logbook mobile phone client screen shot

7 Evaluation

7.1 Usability

As the IL has been developed using the Socio-cognitive Engineering methodology (Sharples et al., 2002), an iterative process of user-informed design and usability testing was conducted. Five versions of the software were publicly released during the seven month development phase. Users were involved in structured focus groups and heuristic evaluation before and after each release. Twenty students from a mixture of science and humanities disciplines, who were either notebook or Tablet PC users, trialled the software over a ten weeks and reported bugs and observations on an ad-hoc basis. Usability specialists from within the team also conducted expert reviews. An external reviewer was appointed by JISC, who thoroughly tested the penultimate release.

7.2 Technical

Technical conformance to requirements was evaluated through expert review within the team. Unit testing (NUnit and JUnit) was employed to ensure quality of individual components of the software. A group of Engineering students were given the task of 'destruction testing' both public releases and interim versions. Once again, an external reviewer appointed by JISC tested the penultimate release for code quality, stability and functionality.

7.3 Outcomes

The outcomes of the technical and usability evaluations were a series of change requests. These initiated from the users and experts, were reviewed by the design team and then prioritised according to urgency and amount of work involved to effect. Some large changes to overall functionality are yet to be made and have been scheduled for subsequent phases of development. Some bug reports were raised in relation to the applications that are harnessed by IL, however these were mostly beyond the team's control.

At the time of writing, all critical fixes have been completed and a release candidate version has been made public and is available from www.il.bham.ac.uk .

To date, there is a paucity of other learning systems with which we can share learner data using the IMS LIP standard. Therefore, other than to inspect the exported data for XML validation, we are as yet unable to determine the user experience of sharing portfolio information with peers, tutors or other groups.

Although the system has been used by real students in their study, and was created according to real learners' needs, the pedagogical value of the IL has yet to be evaluated. It is envisaged that the greatest implications for learning will relate to the use of the log as a reflective learning tool. As such, it will require long term studies to genuinely measure any effect or perceived value. Such studies would require that learners regularly use the software for a minimum duration of one module, preferably over a whole year or longer.

Despite passing the technical and usability evaluations on a standalone basis, the mobile phone client has too many drawbacks to recommend it for wide deployment. These drawbacks are generally related to the platform and are therefore out of the scope of this project to change. Three main issues were prevalent. First, users found downloading and installing a Java application particularly difficult (irrespective of the application), and few had had previous experience of installing anything more complicated than a ring tone or

wallpaper. Second, different mobile platforms (even differing versions from the same manufacturer) rendered controls and menus differently. The lack of predictability made it difficult to design for the end user or to produce adequate user guidance. Third, the tool depended on a working data connection to the phone or PDA. Most users reported severe difficulties or complete failure to configure a data connection for their device. For those who had successfully connected to their service provider, differences in the way applications handle connections and ambiguity over connection state made it difficult to send/receive data from the Logbook, or to troubleshoot problems.

8 Further Work

8.1 Pilots

A new phase of Interactive Logbook has begun, again funded by the JISC. In addition to making changes to the software, we will be running pilots in order to conduct thorough usability and pedagogical evaluations. Four cohorts of up to forty learners in each will use the software between September 2005 and March 2006 and will feed back via questionnaires, focus groups, diary studies and interviews. The log for each learner (once anonymised) will also be used as data.

One of the main aspects of research will focus on whether the IL really lowers (or even presents) barriers to recording learning, and how these barriers may be further lowered.

8.2 PC client

Although running all of the user's software inside the Interactive Logbook makes for an integrated experience, users have commented that this is not always the most appropriate mode of interaction. For extended periods of work in, for example, a word processor, it would be better to use this in its native full-screen mode. Also, there will inevitably be applications that cannot or have not yet had plug-ins created for them. For both of these reasons, the current redesign will allow for the Interactive Logbook to be used in two modes: the first, as originally designed and as demonstrated in (figure 1) above; the second will be a 'factored out' approach, where applications (themselves designed for plug-in functionality) will gain an IL menu item or 'Log This' button, while a task tray icon will provide access to the log itself. In this second mode, the task tray icon will offer further utilities including a screen-grabber to be used where content in applications cannot be accessed directly.

The second imminent change will be to increase the user's choice regarding automated log collection. As users will inevitably wish to use their log in many different ways, it is certain that they will have differing requirements for the amount and type of data collected by the log. Some may wish to record automatically everything that happens and every piece of information processed. Others may only want to add records manually. Some may wish to be prompted to make log entries. More likely, users will wish to adjust between each of these methods, depending on the document or application they are using, or the people with whom they are collaborating on any number of other rules. A form of control panel will be added to allow for this.

Third, there are clearly shortcomings in the tools available for managing and making sense and use of the portfolio. Determining good practice in this regard is itself a significant research project. The pilot implementations are expected to throw further light on this topic, together with an increasing body of literature and other software systems.

8.3 Mobile phone client

Development on the mobile phone client has been halted for the time being owing to the difficulties described above. However, we believe the application to be important to the success of IL. Future development is likely to take one of three directions. Standardisation and enhancement to the mobile Java platform may make the existing development path

more viable. An alternative approach would be to make platform-specific implementations for each of the three or four major phone operating systems on the market. This should increase the success ratio, but will also be considerably costlier to develop. The second alternative would be to wait for Macromedia's Flash Lite (Macromedia, 2005) to be deployed on devices in Europe and investigate whether it has advantages over the Java platform as a multi-OS delivery medium.

9 Conclusions and Discussion

The Interactive Logbook has been developed at the University of Birmingham, following in the wake of many other mobile learning research projects. Lessons learned from those earlier investigations have been used to guide the design of this system. Such lessons include: the learner's need for single point source of digital information; the need to lower barriers to recording progress; the need to incorporate familiar, best of breed tools rather than substituting home-grown applications.

By creating a 'one-stop-shop' for digital learning on a personal device, it becomes possible to create a more complete record of learning than would otherwise be achievable. A lightweight mobile client is believed to be important to the success of the Logbook because of its ubiquity. However, technical limitations in the platform at this stage are preventing widespread uptake. It is envisaged that significant advances either in the mobile Java platform or in some other standard, will make this possible within the next year or two.

Although still in a phase of research and development, the team have delivered a piece of open source software, available to others in the HE community for trial and further development. The system to date has been favourably evaluated from technical and usability points of view. Full review of the benefits of such a system will have to take long term pedagogical evaluations into account as well as observation of the patterns of use. Such a strategy has now been formulated and will commence in the next academic session.

Networked institutional systems such as VLEs are no longer adequate, having almost fallen victim to their own success, with so much learning activity now taking place online. Future scenarios of use are likely to see students consuming from and engaging with such systems in increasing measure. However, the demand for more personalised, portalised (or aggregated) experiences will see such interactions taking place through intermediate systems, which are likely to be under the learner's ownership, and some of which will necessarily be mobile. We believe that Interactive Logbook could be the first of this new generation of integrated, aggregated, personal, mobile learning environments and is likely to be joined by others in the near future.

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