

## Implementing a Student Learning Organiser on the Pocket PC Platform

Oliver Holme and Mike Sharples  
*Educational Technology Research Group*  
*The University of Birmingham, B15 2TT, United Kingdom*  
Email: [oliver.holme@dsl.pipex.com](mailto:oliver.holme@dsl.pipex.com), [m.sharples@bham.ac.uk](mailto:m.sharples@bham.ac.uk)

### Abstract

*The paper describes the development of a learning organiser for students on Pocket PC computers that utilises a connection to a wireless network. The methodology and design principles aimed at creating a useful and usable system are explained.*

*Keywords: mobile learning, user interface, learning organiser, handheld computers, wireless networking*

### 1. Introduction

For many years, computers have been used to enhance the learning experience for students in Universities. In 1997, the Dearing Report published the findings from an extensive review of the Higher Education System in Britain. The report predicted that students will increasingly expect to have continuous and seamless access to the computer network of the institution at which they study (NCIHE, 1997).

Powerful software and the Internet have extended the possibilities for computer-based learning. Many universities have adopted Virtual Learning Environments (VLE), such as WebCT, as a method of facilitating student learning. These provide tools to support a wide range of teaching and learning styles that make the most of a University's existing network of desktop computers (WebCT Inc., 2001).

There have also been rapid developments in the potential hardware platforms to support learning aids. Due to the increasing power and miniaturisation of computers it is now feasible to have a handheld mobile computer that delivers rich media content to the palm of the user's hand. Recently, wireless technologies have further extended the usefulness of these mobile computers. Wireless access to a network provides the potential for instant communications and ubiquitous access to learning tools and materials.

This paper describes a project that was undertaken to maximise the benefit of the latest developments in mobile computing and wireless networking.

### 2. Project aims

The general aim of the project was to design and implement an effective Student Learning Organiser for students in the Department of Electronic Electrical and Computer Engineering at the University of Birmingham. The system takes advantage of a Wireless Local Area Network (WLAN), using the IEEE 802.11b standard, which has recently been installed in the Department.

It was important to involve the potential users of the system at all stages in the project in order to ensure that the design met their learning needs and aided their learning activities. The aim was to develop a useful and usable system that adds value to the current teaching and learning methods. A survey questionnaire was distributed to one hundred undergraduate students in the Department in order to gain an understanding of their current learning practices and to identify areas for improvement. 27 questionnaires were returned. The two topics identified as key areas for development were that of time management and the ease of accessing course materials. The tools for achieving the aim should be closely integrated into a single learning environment.

It was clear from the user survey that the users wanted a system that could be personalised to meet their individual needs. Therefore, the target of the project was to produce an integrated and customisable system that would make it easier for students to handle their time and course material more effectively in order to facilitate their learning.

### 3. Hardware platform selection

The choice of hardware on which to implement the software was informed by the results of the student survey. It was apparent that, in general, students required

small palm-sized devices. The decision was taken to target Pocket PC devices that run Windows CE. This platform has a large number of applications available and also provides a significant processing power advantage over Palm devices. The software was developed and tested on the Compaq iPAQ H3870, although care was taken to ensure that any Pocket PC should be able to run the software. This allows for a great deal of flexibility in the choice of the exact hardware on which to run the system.

The Compaq iPAQ does not yet have built-in WLAN capability. This was added using an expansion caddy that accepts any WLAN PCMCIA card. Other Pocket PC devices can be expanded in a similar way.

#### 4. System design

From the outset, it was decided to implement the system as a series of small independent tools that could be joined together to provide the complex integrated learning environment that was required. An extensible framework was designed that allowed tools to be added as and when necessary.

The ‘Time Manager’ tool was designed to provide the time management functionality identified as necessary by the students. This includes the ability to create, delete and view timetable events and deadlines. An additional feature is provided for importing large numbers of timetable events and deadlines from a text file. This mechanism allows the distribution of a timetable file that contains all the required timetable information for a module of the course.

The ‘Course Manager’ tool allows a student to download course material packages via the wireless network. These course material packages are created by lecturers using the complementary tool, called ‘Course Builder’, that was designed and built to run on a Windows PC. The ‘Course Manager’ tool allows students to browse locally stored course material as well as providing a seamless link to remotely stored data that is published on the Department network or even the Internet. The ‘Course Manager’ supports learning materials published with Microsoft Word and Microsoft PowerPoint\*. Portable Document Files (PDFs) and HyperText Markup Language (HTML) are also supported for providing rich media materials.

The need of students to personalise their learning environment was addressed using a customisable information system based on the Today screen that is available on all Pocket PCs. The Today screen allows users to add and remove components that show information relating to their current day. New

components were written to show a timetable overview and detailed information of the next timetable event (Figure 1). These components can then be turned on or off as required by the user.

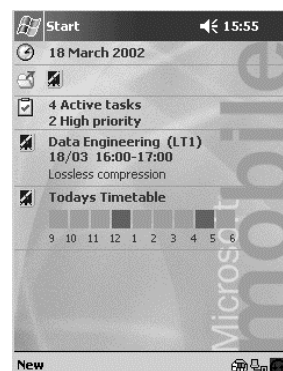


Figure 1. – Today screen showing newly developed components (bottom two items)

#### 5. User interface design

In order to create an intuitively usable system, Object View Interaction Design (OVID) was used throughout the design stage. OVID provides a rigorous methodology for creating useful software with a usable interface (Roberts et al, 1998). The basis of the approach is to identify real-world objects that can then be implemented in the software. For example, the real-world object of a timetable event (e.g. a lecture) was used in the learning system. By translating real-world objects and events into software objects, users should be familiar with the objects and find it more intuitive to interact with them.

All interactions with objects are performed through views. A view is what the user sees on screen and is used for showing or setting the properties of the objects in the system. While designing the views for the user it was important to consider the screen size of the Pocket PC device, which is only 320 by 240 pixels. This made it essential that only the information that was absolutely necessary was shown on screen at any one time. The OVID approach aided this process as each view is intended for a specific purpose and, hence, the necessary information can be easily identified.

Although the information had to be compact, it was important that the readability of the data was not sacrificed. Therefore, a group of students were consulted throughout the design and implementation in order to ensure that a good solution was found. An example of a view that was developed was the ‘Timetable Overview’ (Figure 2). This view represents the commitments of a student in a simple way that can be interpreted at-a-glance. The timetable is shown as a series of boxes representing hourly slots from 9am to 6pm. A colour scheme is used to represent the status of each hourly slot.

\* With iPresentation Mobile Player, Presenter Inc. (Website: www.presenter.com)



Figure 2. – Timetable overview

This ‘Timetable Overview’ was then combined with a ‘Timetable Event View’ that provided details of a specific timetable event. These two views, combined with a date selector\* produced a powerful and compact method for browsing a user’s timetable. The resulting combined view was called the ‘Timetable Browsing View’ (Figure 3a).

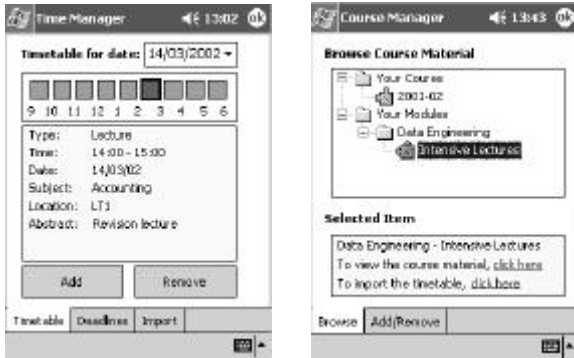


Figure 3. – a) Timetable browsing view  
b) Course browsing view

Likewise, a compact view for the ‘Course Manager’ also had to be found. A tree view was chosen for browsing the course structure (Figure 3b). At the top level, there are the ‘Your Course’ and ‘Your Modules’ nodes. ‘Your Course’ contains details that are general to the whole course, such as yearly timetable files containing term dates and holidays. ‘Your Modules’ contains all the modules that a particular student is studying. Within each module node, there are all the learning packages that the user has downloaded to their device. If applicable, the course material in the learning package can be viewed and the timetable file can be imported.

## 6. Implementation

The system was coded mainly in eMbedded Visual Basic. The Today screen components were developed in C++.

It was decided that the new system should be closely integrated with the Pocket PC platform. This meant that existing Pocket PC applications should be reused where applicable and that the interface of the new software should be consistent with the standard Pocket PC interface. By providing this consistency of operation, it

was hoped the usability and the time to learn the system could both be improved.

### 6.1. Integration with Pocket Outlook

Pocket Outlook is the application that comes with all Pocket PC devices for managing diaries and commitments. While the Pocket Outlook tools such as ‘Calendar’ and ‘Tasks’ did not provide the required functionality, the database and the background functionality, such as the search facility, were useful. It was decided to use the database to store all timetable events and deadline information.

Access to the Pocket Outlook database is carried out via the Pocket Outlook Object Model (POOM). The objects from the OVID design process had to be translated to objects in POOM. Using POOM eased the development of the ‘Time Manager’. It also ensured that information entered using the ‘Time Manager’ was accessible via the standard Pocket PC time management tools. This tight integration was found to provide a clearer and more usable system for the user.

### 6.2. The Pocket PC installation mechanism

The Pocket PC includes an advanced software installation system. This installation mechanism was used for the distribution of course materials. The ‘Course Builder’ tool used by teaching staff combines the course material files of a learning package into a single installation Cabinet (CAB) file. This file can then be installed directly to a Pocket PC from the web using Pocket Internet Explorer. By using this standard installation mechanism, the standard uninstall procedure is immediately available. The reuse of this technology helps to reduce the time taken for users to learn the system.

## 7. User trials

A user trial was carried out with a sample of 12 undergraduate students. Each student was given a scenario to perform using the system. After becoming familiar with the software, a structured questionnaire was used to assess the users’ attitudes towards the software.

The response to the software was very positive. The views for showing the information in the ‘Time Manager’ and ‘Course Manager’ scored highly. The main weakness of the software was identified as the speed at which it operates. Modest increases in speed could be obtained from optimisation of the code of each of the tools. A larger increase could be obtained by switching implementation language from Visual Basic to C++.

Overall, many students seemed excited at the possibilities of a truly mobile, wireless-enabled learning

\* vbceDateTimePicker from vbce.com  
(Website: www.vbce.com)

system. The way that resources could be accessed on demand was of particular interest to the user trial group.

## 8. Conclusions

This newly developed system provides functionality intended to meet the needs of students. Whilst the feedback relating to the system was positive, some usability issues were raised and these would need to be addressed in future versions. It will be important to develop more tools to add to the framework that perform tasks other than time management and course material management. Further utilities might address more of the needs of students that were identified in the student survey. These could include concept mapping and student collaboration tools.

## 9. References

- [1] NCIHE, *Report of the National Committee (Dearing Report)*, NCIHE, 1997
- [2] WebCT Inc, *Leveraging Technology to Transform the Educational Experience*, WebCT Inc, 2001
- [3] D. ROBERTS et al, *Designing for the User with OVID: Bridging User Interface Design and Software Engineering*, Macmillan Technical Publishing, New York, 1998