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## The Digital Filing Cabinet: Using Web2 Technologies to Collaborate Create and Manage Student Information

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## **Abstract**

This paper discusses the development and piloting of a digital filing system. It promotes the idea of the paperless office or teaching space of the future. This is a tool to improve efficiency, accountability and collaboration when managing data. This system allows you to have access to all your records wherever you are. It allows joint authoring and input of data. Teachers, managers and students, who need to store and manage important data, can customize the tool to meet their needs. It supports a vision of a learning community of the future where all the needed information is right at your fingertips wherever you are working. Key players can access records over the web at any time or place. There is also a stand-alone version on the desktop when you are not connected to a network. The system is designed to improve efficiency and effectiveness of staff. This paper documents the participatory action research model used in the development and evaluation of the system in which an ICT specialist and an educator worked collaboratively over two years to trial and pilot the system. This system is currently being applied in a tertiary setting, managing a course that runs over three campuses. The technology and principles of this interactive web-based student management system can be used in school settings for digital portfolios, managing assessment records or office settings for data management.

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### Introduction

*“Leading edge companies are no longer those who have displaced and controlled labour with technology but those who have found ways of using technology to enhance the value of the labour they employ.”* (Young, 1998, p141)

There has currently been much debate in Australia about the “Digital Educational Revolution”. This term was used by the new Labor government as part of the initiative to provide funds for the use of technology in education. The Rudd Government has committed to spend billions of dollars to fund the purchase of computer hardware for schools (Gillard, 2008). Although there is much debate on the subject we are not seeing much evidence of how this technology can and should be used to enhance educational outcomes. Young, in his book entitled “The curriculum of the future”, describes how technology can be used in creative ways in a learning society (Young, 1998). This paper presents a practical example of the digital educational revolution in action. It describes a participatory action research project in which web2 technologies are utilised to improve the management, learning outcomes and student satisfaction of a tertiary post-graduate course in teacher education. In this project an

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online data management system was developed in-house by two academics over two-years and is now being implemented by the teaching team in a post-graduate course.

Many educators report that much of their time is used in performing basic administrative tasks involving record keeping in the current drive for accountability. In this paper we would like to share with other educators how we are using new technologies to support and manage our routine daily practices making them more efficient, time effective and environmentally friendly. We have developed a technology-based application called the “Digital filing cabinet”. We are using technology to efficiently to record, store and share student information. Through using technology to perform these routine tasks, which are essential for the efficient management of courses, the educators can focus their energy and time on delivering a better teaching and learning experience.

The significance of this paper is that very little has been published by academics and end- users about the development and methodology used in online databases. The majority of these databases have been developed and marketed by commercial concerns, who are protective of their markets and thus restrict the sharing of intellectual property. This project has utilised the web-sharing facilities of web2 technologies, which have made it possible for the sharing and joint authoring of online records. These technologies make it easy for end-users to design and create their own customised databases, which can be adapted to the specific needs of the user.

The difference between the Digital Filing system and the large databases used by many institutions is that it is user driven. The larger systems are usually centrally controlled allowing read only access to the end-users. This system allows the users to retrieve the information they need from the central system but then to add and modify this information to suit their specific needs

### **The Setting**

This project is situated in a university in Perth, Western Australia in a course in the faculty of Education and the Arts. The application has been developed for a large post – graduate course in teacher education. This is a complex course to manage with fulltime, part-time and mid-year enrolment options. There are more than ten fulltime staff members and approximately twenty part-time sessional staff teaching in the course. It is a one-year post-graduate course of study; there is only limited time in which to meet the students learning needs. The course caters for between 200-250 post-graduate students distributed over three venues, metro and country.

One of the dilemmas facing the academic co-ordinator of this course was that in response to fiscal cut backs in tertiary education and the serious shortage of teachers in Western Australia the student staff ratios in this course increased dramatically (Department of Education and Training, 2006). The Top of the class Report (Commonwealth-Australia, 2007), a comprehensive report commissioned by the federal government into the quality of preservice teacher education in Australia, discusses the impact of the under-funding of teacher education courses and suggests it is an area of national priority. (Angus, 2006; Commonwealth-Australia, 2007). The impact of the under-funding can be seen in this course, which previously ran efficiently on one campus with one academic co-ordinator to approximately sixty-five students for many years. The course had now grown to accommodate over 200 students yet was still co-ordinated by one academic. These factors motivated us to teach and work differently, initiating the project as described below.

## The Motivation

Faced with the pressures of reduced resources, raised student expectations and marketplace competition to attract and retain students, we came to a realisation that we needed to work and act differently in order to continue to offer a well-managed course. We needed to use the new technologies, working smarter to make our work more efficient. There are many references in the literature about groups who learn and think differently because of the use and exposure to technology (Donneson, 2007). Prensky, coined the term digital native to describe a group that have been exposed to technology and integrated technology into every aspect of their lives (Prensky, 2004). Many of our students and some of the teaching staff fall into this grouping of those who integrate technology seamlessly into all aspects of their lives. There appears to be an emerging style of pedagogy incorporating new technologies to cater for digital natives as described by Kenneth Green in his keynote address at the Apple University Consortium Conference in 2007. In Green's research entitled the "Campus Community Project", an ongoing study starting in 1990 on the role of ICT in American Higher Education. In this project Green surveyed the academic staff and discovered a small group of educators who were embracing the new technologies, grappling with ways to integrate the emerging technologies in their teaching to enhance the learning experience of the students. Green called them millennial educators (Green, 2007). This descriptor fits the type of pedagogy used in this project where we used technology to suit the teaching and learning styles of the educators and the students.

The construct of using technology to enhance our learning and thinking styles has been described by Lane and other authors using the term distributed cognition in which intelligence can be an interrelationship or network of resources that individuals use to solve problems and generate new ideas (Lane, 2007; Nuckolls, 1998). In this paper we build on the concepts of distributed cognition using web 2 technologies to harnessing the collective skills and memory of team members. We proposed that by incorporating ICT tools in our pedagogy we could achieve more than an individual could alone, or could have been achieved in a previous paradigm without the use of the technology. However it is noted in the literature that many of "millennial educators" are engaging in cutting edge work using new technologies, however much of this work goes unrecognised by the traditional structures in which we work which ca (Green, 2007). This lack of institutional support can slow down the adoption and hinder progress in the use of new technologies in institutional settings.

A factor motivating the use of ICT was that we wanted to model to our students, preservice teachers that as faculty we were using technology in innovative ways to enhance the teaching environment. This was one of the recommendations of the "Top of the Class Report" an in depth report on teacher education in Australia which proposed that their should be more use of technology in teacher education courses (Commonwealth-Australia, 2007). Research indicates that many preservice teachers, particularly females, lack confidence in using technology and could benefit by seeing positive role models interacting with technology (Comber, 1997; Lane, 2005, 2008).

## The Challenge

When managing large groups of students located over three campuses, the course and unit co-ordinator(s) needed to have speedy access to a wide range of data about the students, to support them through the course. With the introduction of course fees the academic environment has been transformed into more of a user pays scenario. This has resulted in a different set of expectations from students who see themselves as clients buying a service.

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This group of students may have different expectations of academics seeing them as service providers (Levin & Belfield, 2003). In this user-paying scenario, there are new levels of accountability and increased expectations of academics over and above their traditional teaching roles. One of the challenges of teaching in the knowledge society as described by Hargreaves, is that education is viewed as a commodity to be bought and sold (Hargreaves, 2003). The students expect a short turn around time and quick follow-up of issues and problems, by the academics and the course co-ordinators. Thus we decided to exploit one of the advantages of working in a knowledge society, the availability of new information and communication technologies which can be used to make learning organizations more efficient and competitive in a market-based economy (Fitz, 2002; Hargreaves, 2003; Lane, 2008).

The interplay of these factors led to the collaborative development of this technology-based project. This project was designed to assist educators, course co-ordinators and managers in the complex task of tracking, monitoring and improving the student experience and to promote good student outcomes through the use of an interactive, online, electronic, paperless support system (EPSS) or digital filing system. The digital filing system collates a range of vital data, including an initial online placement survey, to support a high quality, effective teaching program for large cohorts of postgraduate students. The design of the project will be described in the next section of the paper.

### **The Project Design**

We decided to replace the individually kept paper-based record systems used by individual staff members with one electronic system. We applied for a teaching and learning grant which funded the purchase software needed for the project and paid for technical support to develop the system. The design criteria were that the system had to be easy to use, as some of the teaching team had limited ICT skills. It needed to be secure, password protected yet accessible to multiple users over three venues. Users needed to have varying levels of read/write privileges. There needed to be a web-based and a stand-alone machine-based version. We embarked on a two- year pilot study using a participatory action research model in which prototypes of the system were designed tested modified and critiqued by the ICT developer and the academic staff. We are now nearing the end of that phase and are ready to extend the system for wider use.

### **Rationale**

The educator or unit co-ordinator needed to have access to student data and progress records to maintain standards of quality and accountability within the course. When courses are taught at different venues and at different times, student information/records needed to be available to all staff “anytime, anywhere” to promote efficiency. This prompted the incorporation of the interactive capabilities of Web2 online technologies. Initially Filemaker Pro 8.5 provided the development tool for creating the online portal with multiple search facilities this has now been upgraded to Filemaker 9. Filemaker was selected because it works seamlessly across both Mac and Pc environments and can be used by novices with no programming experience using the online tutorials. The system could be upgraded to a server-based version if the project grew.

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Traditionally the academic staff used paper-based files and note keeping systems for student data. As the course grew from 65 students based on one campus to approximately 250 students, on three campuses with large numbers of staff, there were problems managing and communicating student information quickly and efficiently to all stakeholders. The universities' student record management database, Calista, provided read only access and users needed to be online to access data. We needed a system that could be accessed both online and offline. The users needed to have read only access to core data but also needed to create data by adding file notes, assessment results, interview notes and notes of telephone conversations with students. We could not find a system with these capabilities within our university so decided to create our custom made digital system to provide electronic, interactive support, document storage and management.

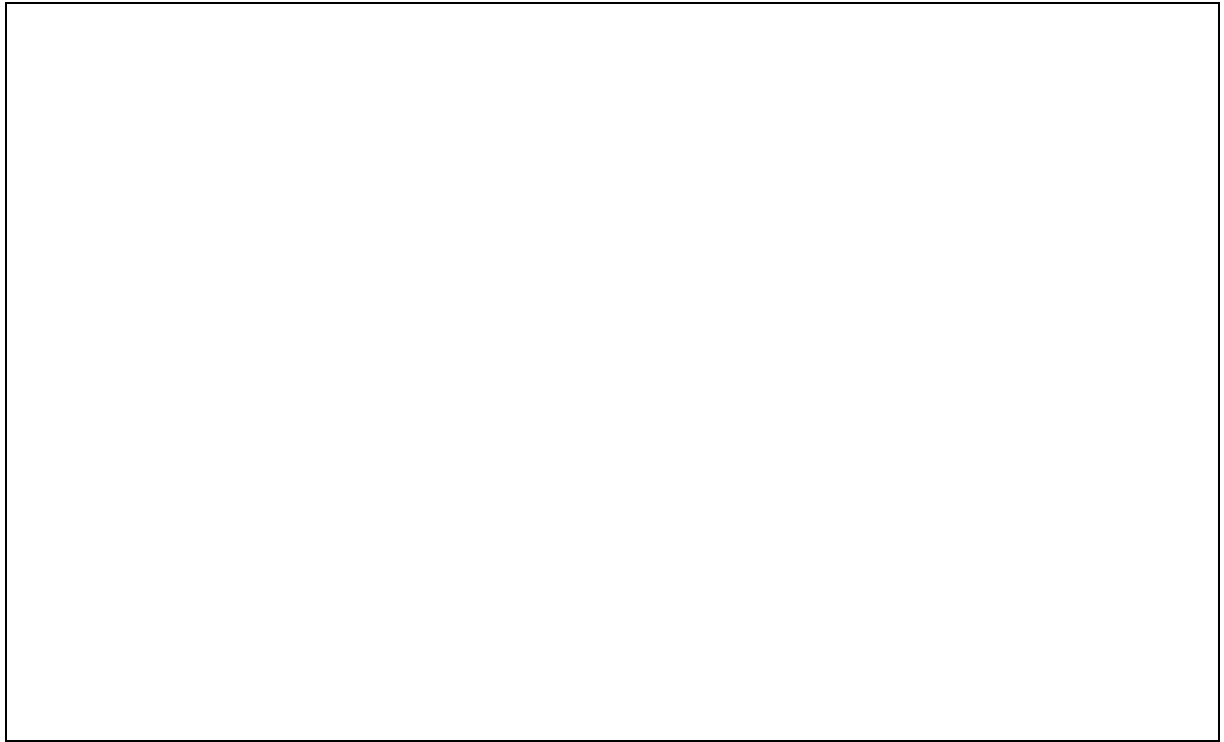
### **The Functional Criteria for the Design of the System**

We wanted a system in which unit co-ordinators and tutors could quickly find student details, such as contact details at the unit and a course level, if they were on-line or off-line. The system needed to be interactive allowing academics to add notes and assessment data.

The teaching team needed to access all data as well as student academic records to allow them to follow up on recommendations to students, particularly where low-achieving students were referred for academic support. It needed to be a robust system to store and collate all academic reports, recommendations and data in one database. The literature indicated that assessment could be an area of conflict and student dissatisfaction in large units (Groundwater-Smith, Ewing, & Le Cornu, 2003; Menzes, 2005; Rowe, 2000). We wanted to develop a system to manage assessment information in an attempt to reduce conflict and student appeals while raising student satisfaction with the course as indicated by the university wide unit teaching evaluation index (UTEI) administered independently to all course each semester.

The system needed to meet a range of security and ethical standards, because it would contain confidential data. We to built security features into the design; for example, levels of password protection so that only authorised staff members could have access to each layer of data. The design included a voluntary online survey to gather details about the students' past experiences to assist in their practicum placement. The system also included information to students about their rights and the purposes of the project. We included a photograph of the student and an area for students to give their permission for their photograph to be used for course administration purposes.

This unit/course level digital filing system built upon, integrate with, and enhance the existing university based student management system (SMS) called Callista (this is read and online access only). The following two figures show how the system was developed to integrate information and the types of access that would be provided see Figure 1 and Figure 2 shows an example of the display of the information.



**Figure 1: Flow of information in and out of the EPSS Course SMS**



The screenshot shows a web interface for a student course. At the top, a yellow banner displays a red 'X' icon and the text "CUR4103 ML 12038 MONDAY ML21 105 08:30". Below this is a navigation bar with icons for "New", "Delete", "Find", and a help icon. The main content area is titled "Rene Dummermuth" and contains a form with the following fields:

ID#	1001155	course code	203
First Name	Rene	unit code	CUR4103
last Name	Dummermuth	activity offering ID	12038
Room	ML21 105 Start Time 08:30 (12038)		
Coordinator			

To the right of the form is a photograph of Rene Dummermuth, a man with glasses sitting at a table in a cafe. Below the form, a yellow banner states: "The tutor is and the tutorial is on MONDAY room ML21 105 08:30".

Below the banner is a navigation menu with tabs for "Notes", "Other Units", "Marks", "Unit\_Address", and "Instructions". The "Notes" tab is selected, showing a section titled "Unit CUR4103 Notes" with a link that says "Click here will create an email" and an email address "rene@dummermuth.com". Below this is a large blue rectangular area labeled "Notes from and/or to the Course coordinator".

Figure 2: Example of student course details display page

## Methodology

In the development and the evaluation of this project a model of participatory action research was used (Hopkins, 2002). Thus the users participated in the development and the evaluation of the product. This was a major strength of the project was that one of the developers was part of the team using the product. This close working collaboration between the ICT expert and the academics resulted in a customized product that met the users needs. This meant that obtaining feedback and evaluating the product could occur easily on a daily basis. This improved the turn-around time for modifications and improvements as all technical issues and design faults were quickly dealt with.

### Internal evaluation of the project

The evaluation of this project was an ongoing iterative process and took place using action research methodology (plan, act and revise) (Hopkins, 2002). The teaching team were an integral part of the development of the product and thus gave regular informal feedback throughout the two-year trial and pilot study. Consultations were also held with external evaluators, the program directors, course co-ordinator, unit co-ordinators and tutors and students throughout the development phases. Course development notes were kept and these have been collated and critiqued and form part of the project review which is summarised below

## Project Review

This project was reviewed in-line with the initial design criteria. The authors had worked in a cross-discipline collaboration in the development phase of the project. The success of the design is due to the consultation between the ICT expert and the academic co-ordinator resulting in a unique product design, which responded to the needs of the course.

There was been ongoing consultation with a number of significant participants in the project. We consulted with the students, tutors and lecturers using the system, through a series of unstructured interviews. We worked with the students and staff to collect the data for the online survey. We are currently doing ongoing data collection from the users of the system on the effectiveness of this digital filing system and are using this information to refine the system. We are happy to share information on this development within the university and the broader academic community.

Design criteria	User feedback- met criteria
Environmentally friendly, paperless system	YES
Online system	YES
Stand alone desktop version	YES
Read, write access	YES
Range of levels of access	YES
Password protected	YES
Include a student photograph	YES
Integrate online survey data	YES
Include a number of different data views	YES
Lock data fields to avoid contamination	NO
Easy navigation system	NO

Figure 3: Collation of feedback from users in pilot study

In summarising the feedback from the users in the pilot study. The users reported that the system developed had the following advantages as compared to the traditional paper-based system

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- The facility to track diary entry/notes
- The facility to email students directly from within the system.
- The facility for academics to build a profile of students` developing skills across the course
- The Unit and course co-ordinators could have access to current reliable data on the progress of each student with a course.
- The course co-ordinators could compare assessment results across multiple units for consistency.
- Course co-ordinators could monitor the progress of the whole cohort by comparing assessment results between units.
- Course co-ordinators could have authentic evidence in case of student appeals.
- Improved management, communication and tracking of queries at both unit and course level.
- Improved practicum placement based on student survey data.
- The collation in one window of student contact details, school contact details and tracking notes and comments related to school placements and visits. This information was useful for staff when making visits to students on practicum that were reported to be at risk of failure.

### **The Educational Advantage of Using this System**

Through a series of informal interview users of the system in the two –year trial period users both fulltime academic staff and sessional tutors reported the following advantages of using the digital system. A number of users reported that using the system had saved them time and some reported improved efficiency when managing records and student data. Most users reported that traditionally they have had a range of record keeping systems with the majority of these being paper-based. The users reported that there was no uniform system of record keeping. One user reported that using the digitised system made the keeping and managing of records for a large unit easier. Another unit co-ordinator reported that a 15 credit point unit with a cohort of 265 students, each doing three assessment points had generated 795 paper-based records per semester and all these records were difficult to manage. The unit co-ordinator noted that at a course level when students were doing four units per semester over three thousand paper-based records were created. This used a lot of paper and created problems in storing these all records under secure conditions. There were also problems retrieving individual records for student appeals.

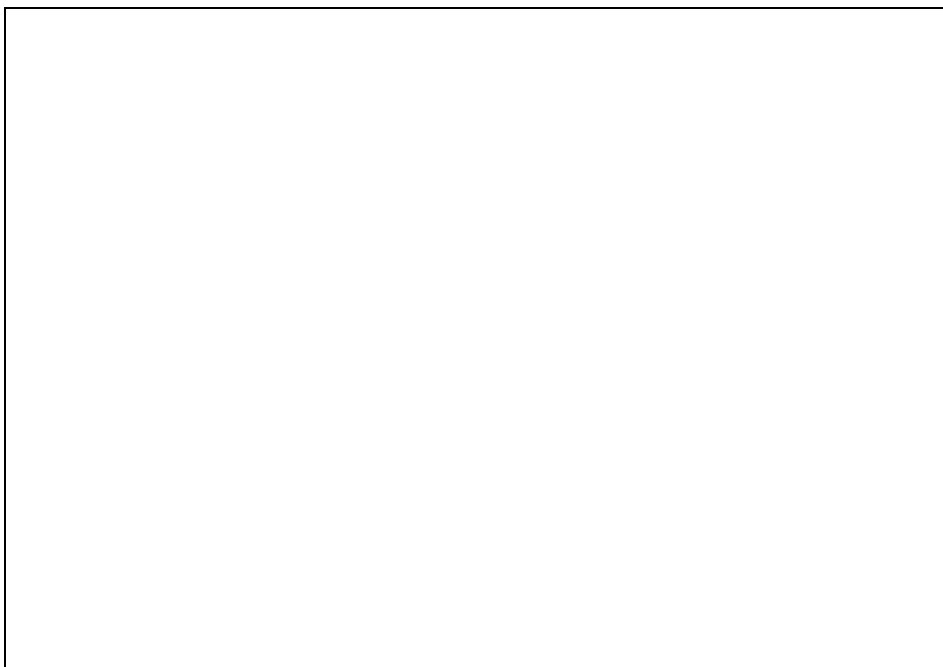
Individual users reported that the course digital filing system allowed them to search records for specific results, assessment items and comments by tutors in a quick efficient way. One user commented that the sharing of information between unit co-ordinators, tutors, course coordinators, and program directors was useful. The course co-ordinator commented that the system facilitated continuity in cases where staff members had left the teaching team as their student record and notes were still available on the system. An example was quoted by a participant that using the digital system allowed her to give quicker feedback on students` progress, for example when the program director wanted information regarding a certain students` progress, it only took a few minutes to email them all the assessment records with the marks for that student. Using the system all the comments and recommendations made by the tutors to that student and the students` attendance records. This process would have taken far more time in the traditional paper-based system. The unit co-ordinator suggested that further developments should be made to the system to include features such as,

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highest, lowest and average marks for an assessment point. The benefits reported for the students were in the quality control of teaching, learning and assessment procedures. This data in the system was used in the *plan teach review process* to improve the course outcomes.

### Design Features of the System

The online survey was included in the system to gather data from the students. This was needed because the course attracted students from a wide range of professions all with different skills. The online survey included in this project gathered data about the students' skills, professional background, qualifications, and strengths that helped in placing them in schools for practical teaching, See Figure 3. This data was integrated into the students profile and was searchable by key words allowing staff to find students with the skills requested by a school for workplace learning experiences.



**Figure 3: Student survey data**

### External Evaluation of the Project

The models and processes developed were documented and shared within the program and for wider implementation following the trials. An academic paper and hands on lab session were presented at Apple University Consortium Create World Conference in November 2007. Participants were provided with a dummy run-time version of the system, which they tested on Apple computers. After the session an independent researcher conducted a series of informal interviews with the participants. The participants were questioned on the usefulness of the product, design features, usability, the clarity of the interface, and recommendation for improvements to the product. The product received encouraging feedback on its usefulness for academics and university management staff.

There were a number of technical recommendations regarding development of a clearer navigation interface and improving the visual appeal of the product. A suggestion from technical developers who attended the presentation was to lock fields to prevent data being contaminated and to improve the visual layout of the interface. These suggestions will

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be used in the further development of the product. This system will continue to be trialled in the Graduate Diploma Program and reviewed to check its effectiveness. The system will be refined to be shared with other courses and programs.

## Conclusion

This two –year pilot study indicated that there is a need for digital record keeping systems at a course and unit level. The users have reported that the system saved time and increased student satisfaction with the course as reported in unit evaluations. The use of this management system also resulted in a reduction in student appeals and formal complaints.

The system proved to be environmentally friendly and cost effective by reducing the number of paper-based records, which saved paper and printing costs. The community partners namely schools in the community appreciated being able to request students with specific skills to teach in their schools. These placements were facilitated by the multiple search capabilities of the database using the integrated survey data. The use of interactive online databases can be adapted for any context in which clients have multiple data sources, which need updating and monitoring by a number of individuals. The database can be used in virtual private networks ensuring the integrity and confidentiality of the data. We foresee this application being of use in educational and health care settings where confidential records are needed particularly in rural and remote setting and with migrant populations. The digital database can be used in schools to create digital teaching and learning portfolios. The system now has the capabilities to house images and small video clips to illustrate students` work.

The strength of the project was in the research methodology utilising participatory action research. This model in which the participants played a role in the ongoing development of the product provided benefits for the developers as they received constant feedback on the product and the users as the product was customised to their needs. In technology-based projects there can be a divide between the technical experts and the users, which can lead to misunderstandings, creating problems in design and implementation. It does need to be recognised that doing developmental work of this nature is time consuming and needs to be recognised in academic workloads and career pathways. The value of this work must be encouraged and supported by institutions. This project has shown the vast possibilities of transforming the teaching and learning environment using new technologies. This small cost low cost project is an example of how simple technology-based applications can take care of routine administrative tasks saving time and money allowing educators to engage with their core business of teaching and learning.

The project has raised a number of issues that need to be investigated further for example the concept of multi-user databases. We will be investigating the problems associated in multi-user access in phase two of this project. We want to develop the system to be used in wireless applications and possibly interfaced with mobile phone technologies. A teaching and learning small grant from Edith Cowan University funded this project

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