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Wireless, mobile & handheld: Where are our teachers and students going with their computers?

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Abstract
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WIRELESS, MOBILE & HANDHELD: WHERE ARE OUR TEACHERS AND STUDENTS GOING WITH THEIR COMPUTERS?

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1. Introduction

There is another revolution in technology happening before our eyes; it's mobile, handheld and wireless - and it's converging. In what ways could this new technology facilitate change in our teaching and learning practices? What planning should we put in place now if we think our universities should be taking advantage of the potential?

2. Technological Revolutions of the Past 20 Years

Technology changes very rapidly but techniques do not. It takes most humans a long time to change their practices to take full advantage of the potential of technologies. When new technologies appear, the early adopters evangelise their potential to revolutionise current practices. Yet this revolution rarely happens. Instead most people integrate the new technologies into their existing practices. They do adopt the technology, but not in revolutionary ways, especially in universities, which paradoxically seems the slowest sector to change.

Think back a mere 15 – 20 years ago. What technologies were then available and could we have predicted the range that we use now? PCs only came on the scene in 1980. Credit cards and EFTPOS cards emerged about then too. Desktop computers were a luxury item and right up till 1991 I had to share one with another lecturer in our joint office as there were not enough to go around. Home computers were not at all commonplace until the mid-90's ie 10 years ago.

Word processing software only came along in the mid 80's and desktop publishing changed the printing and journalism industry very substantially. Spreadsheets like Lotus 1-2-3 and database software appeared soon after as the next "killer application" and we would have to agree that the banking industry has been re-engineered substantially as a result of technological change.

Twenty years ago there were fledgling forms of the internet, but we didn't call it that then, and there were no user-friendly browsers and certainly no Internet Service Providers, nor modems and modem banks. In the 70's, at the organization I worked for, we had to make an "acoustic coupler" ourselves to dial into a mainframe computer. Retail modems didn't appear until the 80's and they were very expensive by today's standards. We had email but no user-friendly integrated office applications. No graphical user interfaces, like the ubiquitous trash can. No mice until the Mac appeared in mid to late 80's.

Fax machines were just arriving and took off rapidly by 1985. There were no mobile phones until the 90's and no laptops. AV Projection and computers was a minefield of non-standardisation and fully darkened rooms were the norm at the beginning of the 90's if you wanted to project. Portability was not possible. Everything was big and fragile. Yet, we early adopters persevered.

More importantly, there were no technicians to assist teachers like me and I used to travel with my own screwdriver and soldering iron for emergency repairs. I had to carry heavy and bulky equipment into classrooms, usually entailing numerous trips, and I had to continually re-arrange heavy furniture to fit the computers in to make an effective learning environment for my teaching. Ergonomics and RSI only made it into the vocabulary in the mid-80's. Maybe to the young ones this seems ages ago but for us middle-aged ones, the 80's and 90's was only yesterday, so technological change has been very fast. In twenty years a staggering range of technology has been brought to market, but have universities changed as a result? Have we undergone the fundamental re-engineering that sectors like banking and publishing have undergone?

3. The Newest Technological Revolution

Now we have a whole new era of communications technology happening before our eyes; it's mobile, handheld and wireless – and it's converging. Of course it remains to be seen whether we actually all communicate better as a result!

Laptops are tiny but handhelds such as Pocket PCs or Palm Pilots are tinier and they are more powerful than the early mini-computers I worked on in the 70's and the desktops of the 80's. This year I changed to a laptop for office, home and travel so I no longer need a separate computer at home and/or a separate computer for travel. Yes, I had got behind in combining the functionalities of these three because, up till now, I still found laptops too heavy to carry easily – my latest laptop weighs under one kilo. Keeping the three synchronised was a nightmare but the time spent on that task still outweighed the heaviness of laptops. I have also bought a Pocket PC which goes with me everywhere that I would previously have taken a diary but it does much more than that. Plus of course I carry a mobile phone. But in the newest revolution I am already out of date. The functionality of the three is overlapping and once the handhelds become more powerful they will make both laptops and mobile phones obsolete.

Handhelds can synchronise with the desktop/laptop and allow you to deal offline with email, internet pages, mini-word, notes, mini-excel, calendar, task lists. Mine also displays full colour images and plays audio tracks and interactive games (an adult GameBoy!). The handheld, with the addition of a fold-away keyboard and a larger monitor for intensive use (I use a light weight flat screen), will soon replace the desktop as it provides complete mobility (and reduces the weight of your excess luggage). It can do infra-red linking to other handhelds for shared meeting notes, swapping business cards etc.

With the addition of a wireless card or modem card it can connect with the internet directly. Synchronising the laptop and online applications takes seconds but mobile phones are now converging with handhelds so soon desktops/laptops won't really be needed. The mobile phone **is** the handheld! Or, is the handheld the mobile phone? In fact I recently saw a wristwatch that had the functionality of a handheld, synchronising via infra-red with your PC

for calendar and contacts, as well as playing video. Anyway, whichever way it goes, the mobile technologies are converging.

Wireless computing is the next big wave in order to service the mobile computing user. US projections show that by 2002, wireless devices such as browser-enabled cell phones will outnumber wired units such as PCs. In the training world, Bell Nexxia (a unit of Bell Canada) has announced that it will offer its sales and marketing staff wireless access to their Learning Management System (ISOPIA) enabling users to register for courses, track courses and make changes to their profiles via mobile phone, hand-held wireless device or Personal Digital Assistant. A recent Australian Computer Society presentation predicts that by 2003, 50% of business people will use 3 to 4 wireless data devices. (This presentation's Powerpoint slides are on the ACS website).

So much for business people – what about our students? Of course many of our students are business people too but how about the younger students? The same ACS presentation outlined the following statistics: in the US 15% of 10-19 year olds are mobile phone users and it is predicted that by 2005 it will be 68%; however in Finland 90% of 13-18 year olds own cellular phones; furthermore it is predicted that worldwide by 2004, 50% of 10 – 14 year olds will be wireless subscribers. What does this mean for Information Technology Services, Libraries and Flexible Learning Centres?

4. Scenario Building for University Adoption of New Technologies

First we need to build futures scenarios. For example, in future universities may not need to have a budget for providing staff with computers, nor will they need to provide computer labs for students. As the mobile phone becomes a handheld computer, these will become a tool that staff and students purchase for their own use because it's an invaluable tool for a wide range of life tasks not just work tasks. My prediction is that in the near future IT will not be institutionally owned but will instead be individually/personally owned in the same way that wristwatches and mobile phones are currently individually/personally owned. The University does not currently provide mobile phones to students or (most) staff because they are as commonplace as wristwatches and people need them for other things in their lives, not just for work. As the mobile becomes a handheld, likewise computers will become a tool that staff and students purchase for their own use, uses that include work, pleasure and family.

4.1 IT Provision

What will we need to provide instead? Handhelds do not yet have Powerpoint so I still need my laptop for multimedia presentations, but that will surely come. So, as laptops and handhelds become more common, we will not need to provide computers in our lecture theatres, just AV equipment. In future maybe even AV will become hand-held. Some have certainly become lightweight enough to carry on the plane with you to conferences.!

Will we still need to provide a network and network access? Or will we just provide servers and downloadable customised applications for enrolment, course materials and assessment? Will we assume everyone gets internet access through their own ISP since they need wide ranging mobile access rather than traditional stationary access from the staff desktop computer or student laboratory computer? Both staff and students will need wide-ranging access not only because they use it for wider uses than just education but also because people in general are more mobile. Our teachers in particular are now teaching at multiple

campuses, often at sites around the world. And our teachers have always done the majority of the teaching preparation in their home offices rather than their university offices. A recent survey of UoW academic staff confirmed this, yet universities in general only provide computers for the university office. Home computers are purchased by academics personally (tax deductible) or from their consulting funds. In my opinion, this management policy could be severely questioned by the academic unions - we do expect our teachers to be using computers so we should be providing them.

Already the Education Faculty at UoW has replaced all academics' desktops with iBook laptops. Academics now no longer have to purchase a desktop computer at their own expense for home use. And using that same computer, they can teach at any of our campuses, as well as present at conferences. As this practice becomes more widespread, there will be substantial cost-savings not only for the University but also for the individual academic personally.

However the newest technology revolution might remove this budget problem entirely.

4.2 Space Design

How will the new technologies affect design of university spaces? What kind of new spaces should we design to facilitate meeting and learning in groups? Can space design assist better communication?

We do not need to provide laboratories for network connection because students can either connect remotely via an ISP or connect from anywhere on campus via the wireless network we are installing over the next 3 years. UoW recently received a $1 million grant from DETYA to pilot a campus-wide approach to wireless networking as a cost effective alternative to the wired approach that is taking so long to complete. UoW also recently won $22 million for a Cooperative Research Centre in Smart Networking and we have a successful partnership with Nortel who have a large research and development group at our main campus. So we can now compute in the café or the car park not just in our offices and labs.

We've come a long way in 15 – 20 years regarding technology and we're about to leap a lot further. But have basic work practices changed? And have we used the potential of the technologies to re-engineer the way we teach and learn? We all do use the technology but at the core the majority are still doing the same old things the same old way.

We still work at individual desks. Academics are provided with a fully equipped university office, even though they often work at home. We are gradually improving the flexibility of our courses so that students do not have to be on-campus all the time. What if general staff like academics did not have to be in the office all the time? A number of companies are rethinking their approach to office space and saving money by using "hot-desks". On days when staff come into the company headquarters, they are assigned a desk using their company ID swipe card and they go there to work with their laptop and mobile phone. The desk has power, privacy and internet connection but it is not personally "owned" for longer than the time staff are there that day. Next time they could be at a completely different desk because their computing and telecommunications is mobile and is personally "owned". How might this concept work in a university context? We do not provide students with offices but expect them to work in carrells in the library or computers in laboratories or at home. Should the same be true of staff?

We mostly deliver information to students en-masse in lecture theatres and less often work with them in smaller groups in tutorial rooms. We push copious lecture notes at them via the internet rather than facilitating learning environments in which they can create the information themselves (we don't let students do real research until 3rd and 4th year!) Although employers are demanding students with communication skills and team skills, we provide little real opportunity to build these skills. Even though most of this technology has been around for 20 years, *de*creasing the amount of lecturing and *in*creasing the amount of small group work in order to provide more interactive and more effective learning experiences, has only been gradual. But the trend is there to see and the University is starting to find that it has too many expensive under-utilised lecture theatres and not enough tutorial rooms for class sizes of 30 – 40 doing group work. Can we abolish under-utilised staff offices and convert the spare space into new learning environments (see hot-desking above)?

What kind of new spaces should we design to facilitate meeting and learning in groups? CEDIR, Library, ITS and Learning Development are working on a concept code-named CODA, for Collaborative Online Development Area. This is a space for JIT DIY WebCT development but it will be a space that supports our philosophy of using a team approach to online subject development: academic curriculum development teams working with a WebCT Developer, Educational Developer, Learning Developer, and Faculty Librarian (and sometimes for the more sophisticated projects, a Graphic Designer and Desktop Publisher). The space must foster the philosophy not hinder it. Much design work still needs to be done but the first CODA will be based in the Library.

It uses a round table arrangement with multiple flat screens mirroring one computer plus a *wireless* keyboard and *wireless* mouse, so that all in the team can work on the development rather than the programmer "owning" the keyboard as generally happens. It is intended that the computer equipment be as non-intrusive as possible so that people can converse around the table without their view being dominated by the screens hence the use of light weight flat screens. Projection facilities will be available for larger groups but in general it was felt that projection subconsciously fosters a culture of presentation rather than collaboration. It is likewise intended that the furniture and computer equipment be flexible, light and modular so that it can be easily arranged into different configurations depending on the nature of the group. A wireless network (eventually) means that there will be no cables running across the floor to the ethernet connection on the wall even when the furniture is arranged in the centre of the room. We are still currently restricted by power cords of course but the more staff start to use laptops and handhelds with batteries, that problem will go away too. In addition an infrared system like Memo can be attached to the whiteboard. This enables teams to brainstorm on a traditional whiteboard but capture the result electronically for all to take away and edit if need be.

Although this first pilot is for WebCT development, a similar design could be used for classrooms and for office meeting spaces. We have recently been changing the CEDIR presentation room into a flexible teaching and meeting space for our teacher training. We hope to have wireless networking installed soon; use laptops with wireless cards for collaborating or presenting; design flexible modular furniture including tables on wheels; and we have painted the walls matt white so that any wall can be used for projection depending on which layout of the room is adopted for each workshop. The only inflexible thing at the moment is the cable to the projector and the positioning of the installed projector, although portable projectors can be booked if a different layout is required for certain events. The

room will also have sliding glass doors in the centre so that it can at times be divided in two for separate booking by two smaller groups. The doors are frosted glass in this case so that the end room can still receive some natural light.

Flexible teaching rooms often need more space than that allowed by architects for traditional classrooms so administrators who follow the "bums on seats" approach are resistant to introducing them. However flexible teaching rooms by their nature get more use hence in the long run the cost to the University should be less than that involved in building more of the traditional tutorial rooms.

4.3 Challenges for Courseware Designers

The bane of any courseware designer's existence has always been designing for multiple platforms and this is not likely to go away in the near future. Just as multiple platforms start standardising, these new technologies have popped up. How do you layout text and graphics for the window on a handheld or on a mobile phone? There is even less real estate on these devices than on a monitor. Instructional designers have always advised academics to reduce the amount of textual information they use but one look at most subject web sites will show that this message is rarely attended to. With students using these new devices to receive course notes there will be an added emphasis on providing editorial services to academics to assist them in the heavy editing their content requires.

Although the potential of the technology is that courseware can be interactive, again a random scan of most subject websites reveals minimal interactivity. The new technologies may unfortunately reduce this interactivity further as student input via the new devices can be fiddly. The ACS presentation mentioned above recommends that designers minimise text entry, minimise data required by the application, and design for 10 second focus as users are usually doing something else at the same time when using mobiles/handhelds. We may need to design clever new ways to facilitate interactivity in our courseware.

5. Conclusion & Questions

So the future is wireless, mobile and handheld but, most of all, flexible. However will it happen as fast as we'd like? And are we adequately prepared for it? What is your university doing to plan for new ways of doing business? Will it improve communication with your teachers and students?