mLearning: Development and Delivery – creating opportunity and enterprise within the HE in FE Context

Interim Report
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Stephen Rose
Lecturer
Learning Technologies

Chris Kelly
Lecturer
Computing and Internet Technologies

Leon Glass
Lecturer
Computing

Contents

Background

'The evolution in education and training at a distance can be characterised as a move from dLearning (distance learning) to eLearning (electronic learning) to mLearning (mobile learning). These three stages of development correspond to the influence on society of the Industrial Revolution of the 18th to 19th centuries, the Electronics Revolution of the 1980s and the Wireless Revolution of the last years of the 20th century'.

http://learning.ericsson.net/mlearning2/project_one/thebook/chapter1.html
Last Accessed 20/02/07

This Project aims to investigate the possibilities for learning afforded by the widespread adoption of mobile computing devices and in particular those used for largely recreational purposes including MP3 players, for example iPods, new generation mobile phones and mobile games platforms such as Sony's PSP which make use of online gaming community connectivity. There is evidence to suggest that such devices might effectively support 'blended' and remote learning, and offer opportunities to widen participation in educational opportunity within a time-scarce, mobile lifestyle context.

From the perspective of enhancing the employment prospects of HE learners on Foundation Degree programmes in Computing, Multimedia and Internet technologies, it is anticipated that the burgeoning use of mobile phones and computing devices for educational purposes will provide a useful context for professionally relevant skills development and entrepreneurship.

Mobile devices have according to JISC (2005), 'become an integral part of modern life at approximately the same time that changes in pedagogical practice have focused on the construction of understanding through collaborative and group activities'. JISC argue that 'tools for learning in the 21st century need to reflect our changing expectations of how, when and where we learn and that they should motivate learners to become more active and engaged in their learning'. The technology seems to offer exciting possibilities for 'any time, any place learning, widening participation and personalised learning.

JISC's eLearning and Innovation strand is currently exploring the ways in which institutions can enhance learning using innovative technologies - in particular mobile and wireless technologies such as PDAs, mobile phones and gaming/'virtual world' software. The principles behind learning in a technology rich context may well offer particular benefits in supporting learners and provide opportunities for 'personalised learning'. Again JISC believe that.. 'mobile technologies place learning firmly in the hands of learners and so could have the potential to move established practice still further towards a model in which learners are supported by practitioners and institutions to pursue their own learning goals'.

A recent Becta Review (2006) of how technology is changing learning acknowledged that the burgeoning use of mobile technologies means that 'we are moving from being consumers of media to becoming creators and producers' posing a challenge for education as the medium offers a creative and practical means of adopting a constructivist approach to learning'. The Review concluded that mobile learning can generate intense benefits 'offering education a range of tools from podcasting to satellite-based systems for both tutor and learner alike'.

Another Becta report reviewing the progress of ICT in education 2006 recognised the emergence and development of a technology infrastructure to support personalised beyond the institution... 'for example, there is increasing use of intranets, managed and virtual learning environments, handheld devices and podcasting'.

This report acknowledged the work conducted by Ultralab and the Learning and Skills Development Agency - their 'm-learning' project which concludes this year aims to investigate the potential of handheld technologies to provide learning experiences relating to literacy and numeracy skills development for young adults outside full-time formal education.

Keegan (2005) provides a useful review of this and other mobile learning projects funded by the European commission in Brussels. The Leonardo da Vinci project '*From e-learning to m-learning'* led by Ericsson Education Dublin effectively solved, according to Keegan, the problems of developing mobile learning for PDAs through the creation of a 'comfortable didactic environment' using *Microsoft Reader Works.* The Project also went some way to developing courseware for phones. Another da Vinci project *'mobile learning: the next generation of learning'*, again led by Ericsson addressed user interface issues to maximise available screen space on mobile phones and identified a development tool *Flash Lite* to author and re-use content. Keegan highlights the success of the LSDA led project 'm-Learning' whose social dimension addressed the needs of disengaged, unemployed learners. This particular project according to Keegan made an important observation with regard to the ubiquitousness of the technology which might re-engage this particular group with education and training..

> 'They all had, however, a mobile phone which they used constantly. The project, therefore, set out to develop courses for them on their mobile phones in the fields of literacy, numeracy and social skills. The focus of the project was on mobile phones, as this type of student did not possess either smartphones or PDAs'
> (Keegan, 2005, p8)

Another significant project identified by Keegan was *MOBILearn* (2004) led by Giunti Ricera, Genoa, Italy. The pan-European University project considered a range of issues pertinent to the successful implementation of mobile learning environments and associated content development.

This ESCalate funded project aims to address a specific aspect of Curriculum delivery focusing on the potential of mobile communications devices to support blended learning delivery methods within the HE in FE context and also to provide learners on HE Computing programmes with a new context for skills development and entrepreneurship.

Technology Update

Since the original proposal for this project was submitted the technology associated with mobile communications and learning had moved on apace. In order to ascertain the level to which new mobile phone and other mobile communications devices have been assimilated by current learners a questionnaire survey (Appendix 1) has been conducted involving a returned sample of 48 'HE in FE' learners. A preliminary analysis of the results is discussed in more detail later in this report

Concurrently a Literature Review has been undertaken in an attempt to capture the role of fast-evolving technologies in providing opportunities for learning. An important existing review of literature on the subject of using palmtop computers for learning was carried out and published in 2003 by Carol Savill-Smith and Phillip Kent on behalf of the Learning and Skills Development Agency. The review was guided by two key questions..

- How have palmtop computers been used for learning?
- What are young adults' experiences of using palmtop computers/

The research synthesised key messages from the then current literature base (approx 140 items). The authors noted that there appeared to be a lack of detailed, or comparative, research studies of projects and trials using handhelds technologies and also commented on the climate of rapid change associated with mobile communications technologies. They observed that 'although it is difficult to predict the future, Smith (2003) suggests that in the next 3 years mobile phone use by younger students will migrate to smart phones, whereas PDAs or phone-enabled PDAs will not be popular except where they support specialist course'.

A later LSDA publication (2005) confirmed the predicted shift to mobile phone platforms and provided a further technology update in respect of mobile technologies combined with a summary of the *m-learning* project undertaken by the Technology enhanced Learning Research Centre. This report authored by Jill Attewell aimed to 'provide an update on the development of mobile phone technologies with the potential for supporting and/or delivering some elements of teaching and learning processes'.

Attewell clearly recognises how 'powerful and sophisticated mobile devices are becoming' and cites Jeff Hawkins, inventor of the Palm Pilot, in Sone (2004) as saying, 'One day, 2 or 3 billion people will have cell phones, and they are not all going to have PCs..The mobile phone will become their digital

life'. The author also considers the rise of 'smartphones' (hybrid mobile phone / personal digital assistant (PDA) and the convergence of mobile communications devices with digital cameras and more recently MP3 players. The report also makes the observation that many mobile communications devices appear to be aimed at business users and support email communication with the provision of larger screens and pull-out or fascia accessed qwerty keyboards. Third generation or '3G' handsets are now making their presence felt in the mobile phone market and allow users to view video content including in some cases TV transmissions. Larger screen sizes and better illumination have meant that new models of mobile phones might reasonably regarded as a viable way of accessing web-based or downloaded multimedia content which might be educational in nature. The report also considers the infrastructure necessary to support advanced handsets such as fast, broad bandwidth connectivity with 3G setting the aspirational standard for carrying enhanced multimedia content and communication.

Following the completion of the m-learning project in 2004 , the LSDA and Tribal CTAD supported by the LSC undertook a new project to create a 'mobile learning toolkit' involving an SMS quiz authoring tool, a pocket PC learning games authoring tool and the use of mediaBoard, a multimedia messaging sytem. The toolkit was piloted in 5 FE Colleges and the comprehensive report on the project provides an interesting insight into how mLearning impacted on teaching and the learnere experience.

The literature review undertaken as part of this particular project confirms burgeoning interest in the use of mobile communications devices and in particular new generation mobile phones to support learning.

'Mobile Learning' is without doubt finding its place in the spotlight as the 'educational revolution *du jour*' (Wagner 2005). A precise definition of the phenomenon is a focus of debate amongst an academic community attempting to 're-conceptualise learning for the mobile age' (Sharples et al 2005). A technocentric view of the burgeoning use of mobile communications devices reveals a plethora of 'smartphones', MP3 players and other handheld computing devices which are becoming ubiquitous in an increasingly wireless world.

The speed at which mobile phones and other portable computing devices have been adopted by the global population is remarkable and it is difficult to obtain a 'snapshot' of precise figures as sales continue to increase it would appear exponentially. Keegan (2005) observes..

> 'Never in the history of the use of technology in education has there been a technology that was as available to citizens as mobile telephony…Ericson and Nokia tell us there are 1.500.000.000 of them in the world today for a world population of just over 6 billion…in China alone there are 358.000.000 mobile subscriptions and this grows by 160.000 a day'

(Keegan, 2005, p3)

The academic community recognises the urgency of establishing a theoretical base for 'mobile learning' as the technology exerts an ever more powerful influence on our lives and potentially on education. Laouris (2005) highlights the importance of defining mobile learning within a wider context in order to establish the emerging educational paradigm and proposes a new framework for the definition of mobile learning that 'considers a repertoire of domains, which embraces not only technical, methodological and educational aspects, but also considers social and philosophical dimensions'. Sharples et al feel that there is..

> .a need to re-conceptusalise learning for the mobile age, to recognise the essential role of mobility and communication in the process of learning, and also to indicate the importance of context in establishing meaning, and the transformative effect of digital networks in supporting virtual communities that transcend barriers of age and culture'

(Sharples et al 2005)

The media clearly have a fascination with new and emerging technology and the popular press carries almost daily reports on how mobile computing devices, particularly mobile phones will exert an even bigger influence on our daily lives. As reported in the Sunday Times (January 14th 2007) the recent launch of the eagerly anticipated 'iPhone' by Steve Jobs at *Macworld* in San Francisco upstaged all comers at the Las Vegas Consumer Electronics show (CES) one reporter bemoaned..'CES is dead because iPhone is all that mattered today. There is a mood that everybody went to the wrong party'. The phone which combines a mobile phone, an iPod and web browser lifted Apple's shares to aan all time high. Apple are confident that the new phone will take the mobile phone market by storm and prove as popular as the now ubiquitous iPod. The phone is due to hit the European markets by the end of the year and hopes for huge sales are founded on the 'extent to which consumers and the technology industry have come to believe in Apple's ability to combine stunning industrial design with ease of use'. The impact of the iPhone on the 'Smartphone' market will be nothing less than revolutionary if critics of these widely available devices are to be believed, solving the interface issues of 'small, fiddly buttons, ill-suited to the many, many different tasks that smartphones ask them to perform'..

The 'storm of publicity' generated by the launch of the iPhone has prompted some commentators, notably Robert Colvile writing in the Daily Telegraph's 'This Digital Life' column (January 20th 2007) to take a broader view of the potential impact of mobile phones, and to examine the extent to which mobile phones have become an integral part of our lives - and how they will continue to change them'. Colville considers that 'the mobile phone, not the PC or the landline has become the world's communication tool of choice' and cites 'Futurologists' who have identified a ''laundry list' of functions that will be subsumed by the mobile: they will connect to the internet,; use voice-

recognition; record and play photos, videos and music; act as your diaries; tell you where you are.......acting ultimately as a Colvile citing acclaimed science fiction author Bruce Sterling 's view 'remote control for life'.

Colvile cites the opinions of several researchers and entrepreneurs who recognise that new technologies are likely to emerge over the next five years which will 'organise and reorganise information' to meet the specific needs of users. The author is clearly aware of the 'cost issue' with respect to data transfer but believes that today's often prohibitive financial barriers to unlocking the potential of using mobile phones might be removed as 'ubiquitous wireless coverage' becomes a not too distant reality. Looking to the near future Colvile concludes his article acknowledging the burgeoning impact of mobile phones on our lives quoting Steve Job's rationale for the iPhone – 'This is the way the world's going' and believing that observation to be no exaggeration.

The JISC e-Learning and Innovation team recently reviewed the technologies available for innovative practice using mobile computing devices including mobile phones recognising that mobile and wireless technologies are becoming of keen interest to all parts of the (post-16 and HE) sector. The case studies highlighted in the report 'Innovative practice with e-learning' show that.. 'institutions are recognising the value of personalised and flexible access to learning..and..at the same time, illustrate how learners are becoming more enabled and motivated to learn through the use of mobile and wireless technologies'. The report considers mobile phones, or more specifically 'Smartphones', as viable devices to support learning recognising the convergence associated with 3G handsets to provide a 'one stop shop' offering a variety of multimedia and communication tools options. The report acknowledges that 'the most successful educational use of phones have been straightforward ones, e.g. sending course information to learners via bulk SMS text messages' and recognises the further potential of these devices to e.g. access resources and capture information and images. The use of mobile phones is recognised rightly as a challenge but..

> 'The perception of something as a challenge may only reflect its relatively recent development or the innovative nature of its use, suggesting that greater understanding of the potential and firmer embedding of the practice within institutional support systems, may yet resolve the issue.'

The report notes that the potential of mobile technologies to benefit learners might be found where mobile devices can link to a wireless network or to the internet.

Several case studies are highlighted which illustrate the use of mobile phones to support learning recognising their potential to meet broader national agendas such as widening participation and the goal of increasing participation in full-time post-compulsory learning and that new generations of school leavers and those commencing post-compulsory studies are almost certain to be regular users of mobile devices, particularly mobile phones.

'..tools for learning in 21st century institutions need to reflect our changing expectations of how, when and where we learn, and that they should motivate learners to become more active and engaged in their learning'

This investigation into the potential of mobile devices to support and possibly deliver learning is timely then. The first 'text book' concerned with mobile learning appeared in 2005 (Kululska-Hulme and Traxler) providing a good overview of the current and future technologies involved which might deliver, support and enhance teaching, learning and training. Again, useful case studies explore the associated pedagogies and challenges. An online community of practice 'Handheld Learning – Handheld and Mobile Technology for Schools and Universities, is a rapidly growing and vibrant community of educators and learning technologists who are eager to share experience and practice in a fast-moving area of technology and educational delivery methodologies.

Stephen Rose

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Mobile Delivery of Learning Objects

This section of the report outlines the concepts and potential delivery technologies for mobile learning. A proposed test-bed system for running trials is outlined that could grow as new Web 2.0 technologies emerge, providing learners with a Personal Learning Environment (PLE) using familiar web tools.
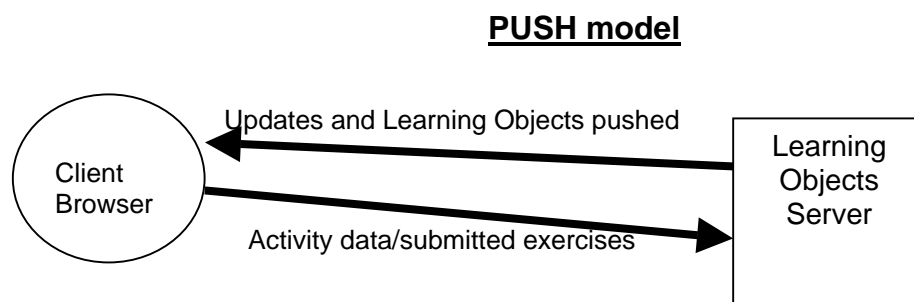
Concepts

Current VLEs/MLEs are based on a 'pull' model, i.e. the learner has to use a browser to connect to a specific server and pull the content from the server. This model has been used with varying success since the early development in e-learning and uses a well established request-response cycle that is manually activated by the learner.

<u>**PULL model**</u>

Client Browser

Request

Response

VLE/MLE Server
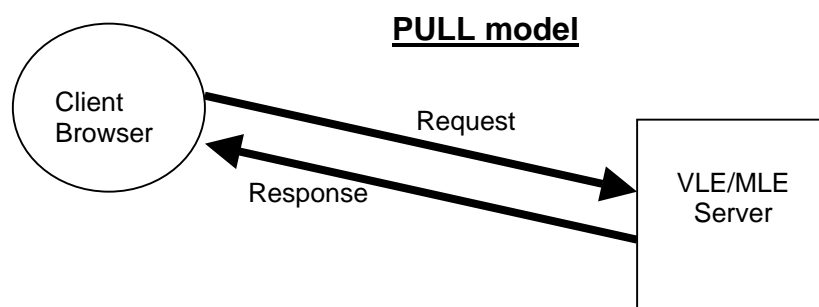
The pull model has limitations in that the material is considered remote from the user (although files can be manually downloaded and stored locally) and may not engage some students considering the expectations fostered by Web 2.0 tools where interaction and immediacy are the key. With a pull model the learner has to remember how to 'connect' to a remote environment and know where to locate materials.
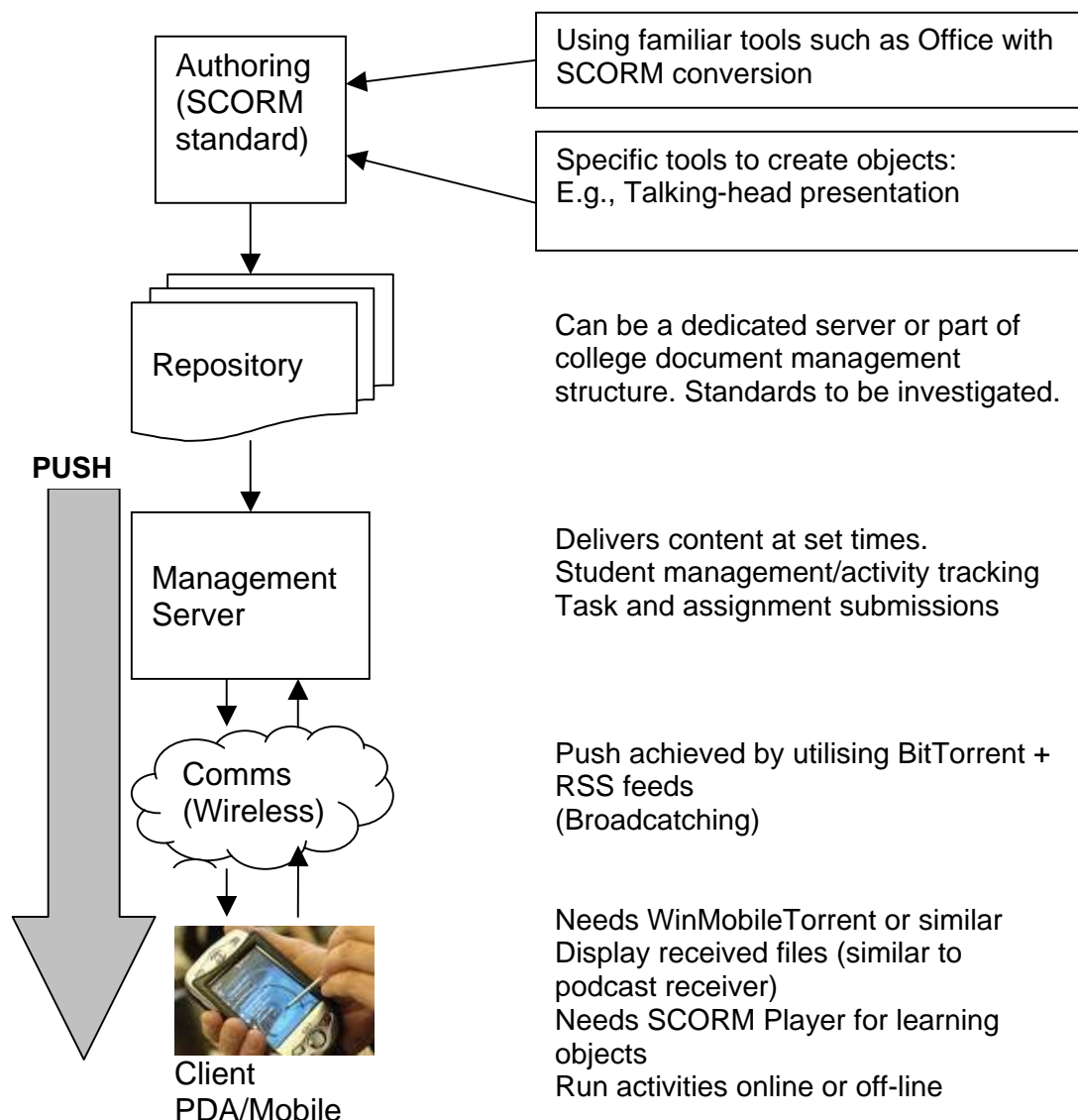
A learning environment based on a PUSH model would *connect* with the learner and be particularly effective for mobile devices. A device programmed for push activities would automatically receive the latest content on a timed basis. This can be automated so that a learner would find relevant learning materials for a particular day or lesson in a display similar to a podcast receiver. The received material would be accessible off-line so that connection times and charges are minimised. Activity data of work done off-line (tests, assignments work, etc) could be synchronised back to the server.

<u>**PUSH model**</u>

Updates and Learning Objects pushed

Client Browser

Activity data/submitted exercises

Learning Objects Server

Potential Delivery Technologies

Web 2.0 technologies are evolving many tools used increasingly for community networking and students are showing a marked preference for using these rather than being restricted to the limited tools offered by a standard VLE which cease to be accessible when a course has finished and their account terminated. A distinct advantage of deploying a mix of these emerging tools is that learners will develop transferable skills that can continue to be used after a course has finished.

After researching and experimenting with a number of technologies, I'm proposing a standards-based framework of components. This can evolve component by component as new technologies and standards develop.

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Authoring (SCORM standard)	Using familiar tools such as Office with SCORM conversion
	Specific tools to create objects: E.g., Talking-head presentation
Repository	Can be a dedicated server or part of college document management structure. Standards to be investigated.
PUSH	
Management Server	Delivers content at set times. Student management/activity tracking Task and assignment submissions
Comms (Wireless)	Push achieved by utilising BitTorrent + RSS feeds (Broadcatching)
Client PDA/Mobile	Needs WinMobileTorrent or similar Display received files (similar to podcast receiver) Needs SCORM Player for learning objects Run activities online or off-line

Authoring learning objects

Learning objects (LOs) delivered by PUSH could include exercises, presentations, handouts, tests, formal assignments, etc. The proposed delivery technologies would also cater for more bandwidth intensive media such as talking-head presentations and video-casts without overloading a server communication channel. The material would be received by the learner in a timely way, appropriate to the current lesson, day or week of a course.

Learning objects complying with SCORM 2004 can be created from standard learning materials using a number of commercially available software tools to be investigated.

Proposed Delivery Technologies

RSS (Really Simple Syndication) is a widely used technology for automating news feeds. Podcasting utilises RSS enclosures to automate the downloading of an MP3 file. I have conducted experiments with an existing college server (Marvin) to automate the transfer of any file of learning materials using a standard podcast receiver called Juice. The RSS feed from the server is a standard XML file. Subscribing to our test RSS feed was uncomplicated and any subsequent updates of the file would automatically download without further action required by the user. This could be extended to download a batch of files to the client device for each lesson, day of a course or week of a course as needed. This is a one-way process and does not provide a path for learners to submit their work or for SCORM activity data to be returned to the server.

RSS could feed multiple learners simultaneously over wireless or mobile networks providing that the files were not too large. As learning objects can include bandwidth-demanding media such as video clips, a further delivery method called *BitTorrent* can be deployed with RSS. BotTorrent divides large files into smaller parts and a server starts seeding 'peers' – in our scenario, PDAs or other mobile devices. Peers then share the parts that they have successfully received so that the communication load is shared. This reduces the heavy bandwidth requirements of the server communication channel. Combining BitTorrent with RSS methods, downloading groups of files can be automated in the same way as podcasts but for any type of learning object.

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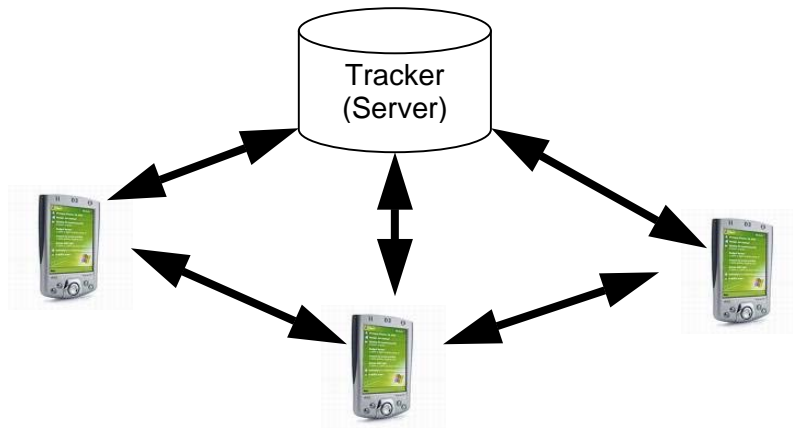
Proposed Test-bed system

My research and initial practical tests have reached a point where the technologies and protocols are understood. Further developmental work is needed to establish a working test-bed system with a view to involving a small group of students for trials. The following components are required and funding from the College sought to move this forward:

1. Software to create sample learning objects (commercial or open source) – requires further investigation of available software and to determine learning activities that can be delivered as learning objects
2. A test-bed server connected to the Internet.
3. Further PDA (or PDAs), wireless or mobile enabled, particularly running WinMobile for MIniBitTorrent.
4. In-house Java development for an easy to use user interface to the delivery technologies described earlier.

Conclusion

I believe that a system could be developed in-house that would be inexpensive (because it largely uses standard tools and protocols readily available), easy to use for students and lecturers and would have long-term viability because the system would integrate with new Web 2.0 tools as they emerge.

Chris Kelly

Development Skills

The skills required by a technology student planning for a career in mobile technology can form quite a large list. This list can become equally as large for the educator trying to create content for their system. The following is a brief overview of the skills required for both of these identified users.

Languages and Environments

To produce any kind of software a student will always need to understand how to code in a standard language such as Java, C++ or Visual Basic. A student will need to have a grounding in the language constructs and data types as well as plenty of experience of manipulating them. This is already provided by any programming course and any module aimed at mobile development would only need to address any differences that arise from mobile platforms. Almost any language can be used to program a mobile device[1] but the most predominant languages are C++ and Java. Microsoft provides a framework known as .NET Compact Framework which allows the developer to use any of its supported languages to develop for mobile devices. Any student with a good grounding in software development will be able to produce systems based on these development languages.

Target platforms for Mobile Devices are:

* Symbian
* Brew
* PocketPC
* Palm OS

Each of the target platforms above are developed by a commercial company and can produce problems with one program running on different devices. A mobile developer is currently expected to spend as much time porting applications between devices as they are developing the code[2]. The article referenced states that a company, a games company in this case, with twenty applications to market across all supported mobile devices would need to create five thousand separate builds of the same program. Access the article to discover how much this is predicted to cost as well as its discussion of strategies for managing this huge task. The article highlights that development company's value a range of language skills and a good understanding of target hardware platforms. As the industry matures I would expect this situation to improve to the benefit of all involved and a standard mobile development platform will evolve.

J2ME[3] is a development platform based on the Java programming language. It is an attempt to create the previously mentioned standard platform for mobile devices. This platform is currently the most popular and most mobile

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[1] [Language list]
[2] [Porting]
[3] J2ME = Java 2 Micro Edition from Sun Microsystems

devices support at least one of its profiles. One of its aims is to remove the porting problem from the developer by providing a virtual machine, KVM[1], which provides a standardised base of code available on all devices. To develop a mobile device using J2ME the student will need to have studied the API and understand how problems are solved with it. This is partly related to the standard learning mentioned above as well as understanding the limitations of a mobile device. The porting problem has not been removed completely and the developer will need to be aware of which platforms are targeted and create separate builds appropriately.

J2ME programs are distributed as a midlet[2] which is intended to run in much the same way as an applet runs in a web browser. All platforms, with the exception of Palm OS, can run a java midlet directly through its KVM. Palm OS platforms need the midlet to be ported to a special format that allows it to be run on these devices.

Microsoft's .NET Compact Framework is an attempt to create the same kind of platform that J2ME provides. It will allow the developer to create parts of a system in any of the supported languages and stitch them together to create the final system. One downfall of this framework is that it is only supported on devices running PocketPC. PocketPC is produced by Microsoft and is generally found on higher specification, more expensive, devices.

Flash Lite is a relative newcomer to the area but has a lot of promise for mobile development companies. Flash content can be created in much the same way as it is for inclusion into web pages except the target will be a mobile device. A Flash player is required on the device to play the content and currently about one hundred and fifty devices support the Flash Player and ship it already installed. Flash needs to be taken seriously by anyone developing content for mobile devices. This is because previously Flash programs usurped Java applets on web pages and are obviously looking to do the same thing for mobiles. Easier development cycles are achieved by giving the developer a graphical environment to develop content and a scripting language for added control.

An article in 2004 from PC Magazine[3] reviewed different development environments for mobile devices. The review was based around which development environment best suited the needs of industry to quickly and easily produce applications for mobile devices. They concluded that the Microsoft .NET framework was preferred by businesses but only targeted high end devices. An IBM environment called Websphere was concluded to be the most productive for coding applications using J2ME and was able to produce programs across different devices. As this article was produced in 2004 I would expect some of their information to be outdated. A general feeling that I have is that more devices now support the PocketPC platform as smart phones have come onto the market with it as the operating system.

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[1] KVM = Kilobyte Virtual Machine kilobyte signifying small footprint
[2] Midlet is the term for a java program that will run on a mobile device.
[3] [Code For The Road]

Distributed Applications

With the exception of some games most applications for a mobile device tend to include some form of distribution. Even single player games require an understanding of distributed systems due to the way they are generally distributed to the user. This should lead a perspective developer to think about how distributed issues will affect their knowledge requirements.

Distributed computing is a subject that should be well understood by any potential developer in this area as most content will be kept centrally due to small amounts of on device storage. Although the end platform is to be a mobile device with restrictions in terms of memory and storage the server side of such a system will be the same as any other large scale distributed system. This will require skills in database creation and management, network technologies, server side scripting, meta languages (XML, XSLT etc) and security. Almost any programming language could be employed here but a set of languages that would be most useful would be:

- c++
- Java
- Python
- SQL

Also knowledge of the following scripting languages may be required:

- PHP
- ASP
- JSP
- Perl

None of these server side programs will ever be ported to a mobile device but will provide a supporting framework for content provision depending on the nature of the application. In this context the device can be considered as a client to the server and will provide little more than a front end to the user catching input and relaying it back to the server side system. Systems security becomes an important issue when developing this type of application as identification and authentication will need to be in place so that users can access the materials they require but no malicious intent can be carried out either by an authorised or unauthorised access.

The mobile developer may well never have to be involved in the development of this side of the application. A team environment could be in place with different teams concentrating on different sides of the system. I would suggest that a programmer involved in these types of systems would inevitably be asked to apply their skills where needed and a understanding of these issues would improve the employability of students.

Educational Systems

Mobile devices currently seem to fit easiest into a web site environment. By far the easiest educational system to provide would be a front end to existing on line information. Allowing access to virtual learning environments through on device web browsers would require that the content is provided through WML[1]. This meta- language is used to render web pages to wireless devices that do not have the resources of a desktop pc available. There are two main ways to maintain these pages one of which is to reproduce the pages with the WML format. Another is to separate the content describing it using XML[2] and then parsing it dependant on which browser is requesting the information. Again these skills could be separate from the mobile developer and required by content producers but a good developer would have an understanding of all technologies involved.

A second approach to providing educational content to a student would be to develop a system using one of the above platforms. This approach would require more knowledge of the skill set suggested so far as the system would largely be bespoke. An understanding of the file formats involved would be required by the developer and a standard way of producing them would need to be decided upon. This approach may also require the lecturer to learn some new content creation skills or be able to describe the content required to a third party provider. Multi-media applications are currently the in thing providing a rich visual environment for learners. This can be difficult for lecturers to produce as subject knowledge does not help in creating the programs to demonstrate it. Personally I believe that a sensible approach to creating educational systems would be to provide mobile access to existing materials and add the multi-media content to that as it becomes available.

Leon Glass

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Symbian - http://www.symbian.com/about/index.html
FlashLite - http://www.adobe.com/products/flashlite/
Flash supported Devices - http://www.adobe.com/mobile/supported_devices/

Language list - http://en.wikipedia.org/wiki/Mobile_development
Porting - http://www.gamedev.net/reference/articles/article2134.asp

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[1] Wireless Markup Language
[2] eXstensible Markup Language

Success   stories   -
http://www.wirelessdevnet.com/articles/ericsson/application_success_stories.html

Code for the road - http://www.pcmag.com/article2/0,1895,1579178,00.asp

Mobile Phone / Devices Survey

Mobile Phone / Devices Survey

Hi

I would really appreciate a few minutes of your time in filling in this quick questionnaire for me. I am currently doing some research on the potential of mobile phones and mobile devices to support learning ('mLearning') and am interested in finding out what type of phones and other mobile devices are used by students – also what kind of phones/devices you might want or plan to use in future. This information is to be used only for research and is completely confidential. Your contribution to this exercise may well help you to get even more out of your mobile and/or mobile device and support your studies.

Thanks very much for your help

Steve Rose
Division of Technology
Research and Development Unit

Mobile Phones

1. What type of mobile phone do you currently use? (Make/Model)

2. What features of the phone do you use? (e.g. camera, web-browser, games, music, videos etc.)

3. Did you buy your phone or was it obtained 'free' or at a nominal cost with a contract?

4. Do you use your phone or mobile device to read /send email?

5. What connectivity does your phone have (e.g. cable/port,3G, wi-fi, Bluetooth)

6. What memory card do you have in your phone (type/capacity)

7. What software does your phone use? (e.g. Symbian, Microsoft Windows Mobile 5.0)

8. What do you like best about your phone?

9. What do you like least about your phone?

Other Mobile Devices

1. What type of mobile computing devices (e.g. PDA, handheld) do you currently use? (Make/Model)

2. What features of the device do you use?

3. Do you have an MP3/4 Player?(e.g. iPod and version..)

4. What features of the device do you use?

5. Do you download Podcasts?

The Future

If you were to upgrade your phone what model/capability would you go for and why?

If you were to upgrade your mobile device, MP3 player etc. what would you go for and why?

Do you think you could use your phone and/or mobile device to help you with your studies? If yes, in what way?

Thanks for your help!

Mobile Phone / Devices Survey results and preliminary analysis
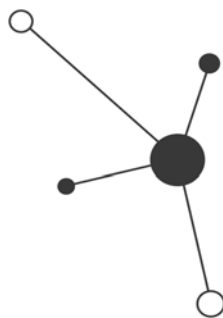
Mobile Phone / Devices
            Survey Results

48 surveys were returned

Mobile Phones

1. What type of mobile phone do you currently use? (Make/Model)

Legend: Nokia, Samsung, Motorola, LG, Sony Ericsson, Other
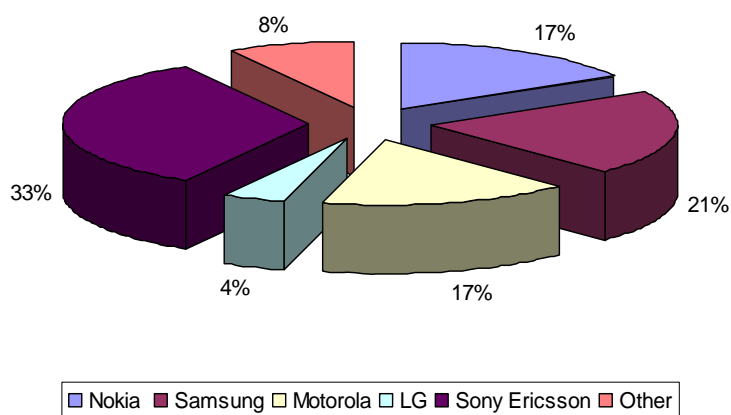
Sony Ericsson mobiles appear to be the most popular by quite a majority, followed by Samsung, Motorola and Nokia which are all grouped very close together.

The 'Other' category contains those less popular brands of mobile phone.

SPV is short for 'Sound Pictures Video', a brand of mobile smartphones sold by Orange. The M3100 and M600 being depicted here.

NEC is a Japanese IT corporation which produce mobile phones.

Legend: SPV, JSS, NEC

JSS I believe, refers to some kind of JavaScript device.

Within the makes of mobile phone, the breakdown into models is as follows:

Nokia Models
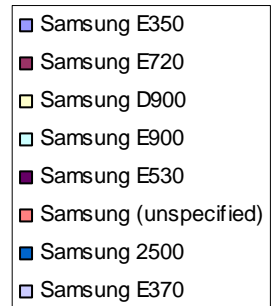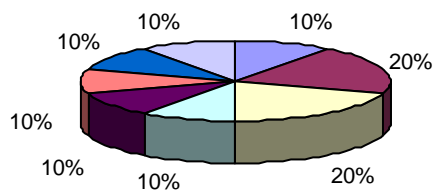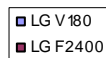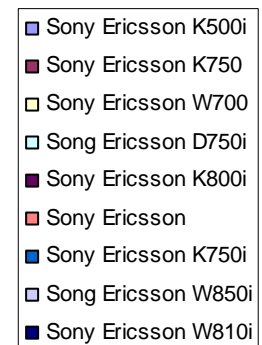
■	Nokia 5110
■	Nokia (unspecified)
■	Nokia 7250
■	Nokia 3210i
■	Nokia 6680
■	Nokia N73
■	Nokia 6310i

13% 12%
13%
24%
13%
13% 12%
13%

Motorola Models

■	Motorola V3
■	Motorola V500
■	Motorola RA3
■	Motorola V3 X
■	Motorola (unspecified)

24% 13%
37%
13% 13%

Samsung Models

■	Samsung E350
■	Samsung E720
■	Samsung D900
■	Samsung E900
■	Samsung E530
■	Samsung (unspecified)
■	Samsung 2500
■	Samsung E370

10% 10% 10%
10% 20%
10%
10% 10% 20%

LG Models

■	LG V180
■	LG F2400

50% 50%
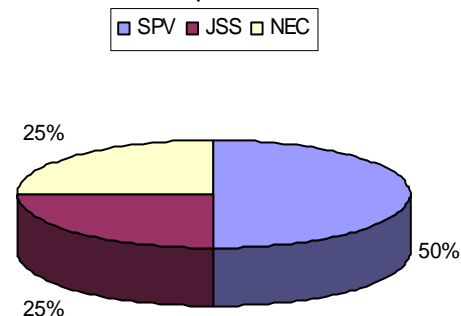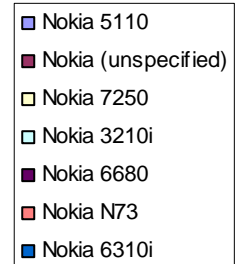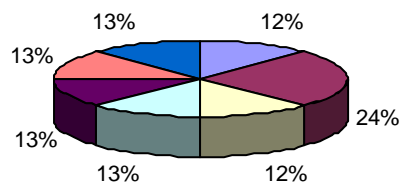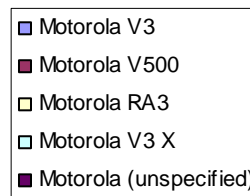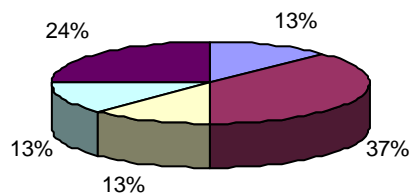
Sony Ericsson Models

■	Sony Ericsson K500i
■	Sony Ericsson K750
■	Sony Ericsson W700
■	Song Ericsson D750i
■	Sony Ericsson K800i
■	Sony Ericsson
■	Sony Ericsson K750i
■	Song Ericsson W850i
■	Sony Ericsson W810i

6% 6% 6% 6% 6%
6%
6%
6% 32%
14% 6%
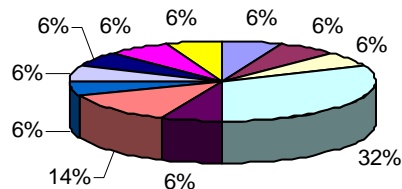
2. What features of the phone do you use?

It is assumed that all those surveyed use their mobile phone for making phone calls and sending text messages, 8%, however, *only* use their phone for this purpose, the majority of people taking advantage of the range of other features available.

Those with the SPV mobiles, use their phone for file storage and the use of Microsoft Office.
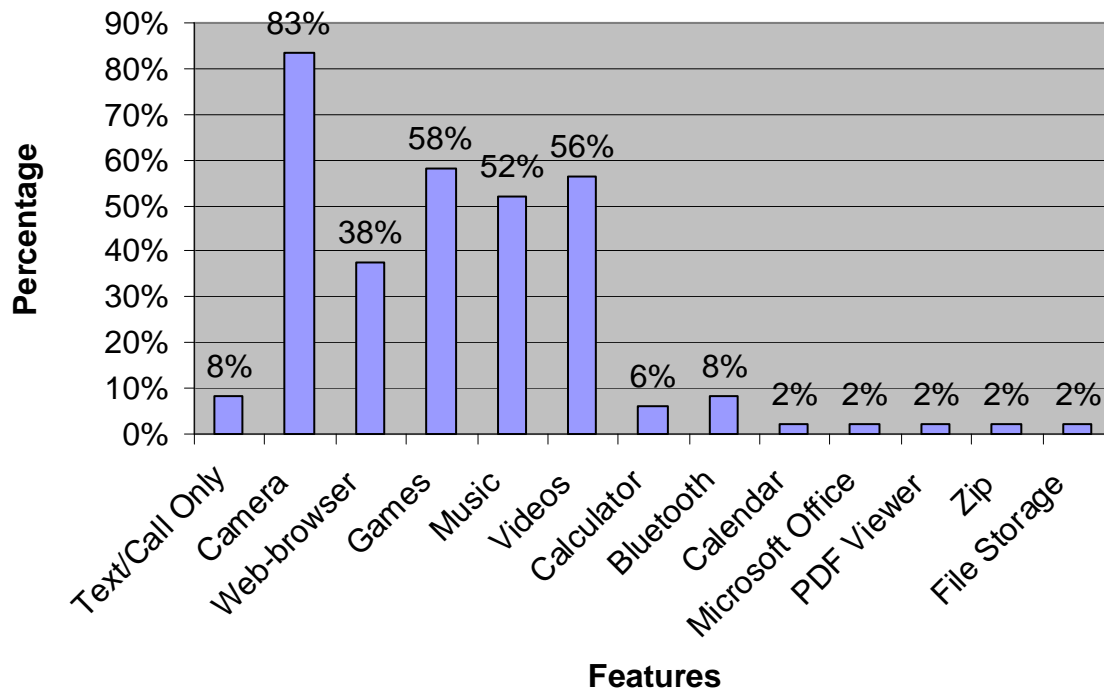
The most popular features, camera, games, music, and videos are generally self-contained within the handset and the use of these features does not necessarily mean that a connection to the Internet or to other devices needs to be present. Web-browsing is, however, also quite popular, although the use of Bluetooth connectivity is not very high.

3. Did you buy your phone or was it obtained 'free' or at a nominal cost with a contract?
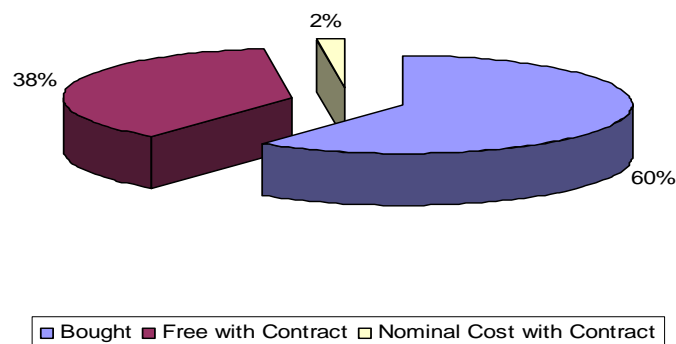
The majority of people have bought their handsets, preferring perhaps a one off payment to the commitment of a contract. The cost of the handsets bought appears to range from £60 - £200, averaging around £120, thus showing that people are willing to pay a lot of money for modern features
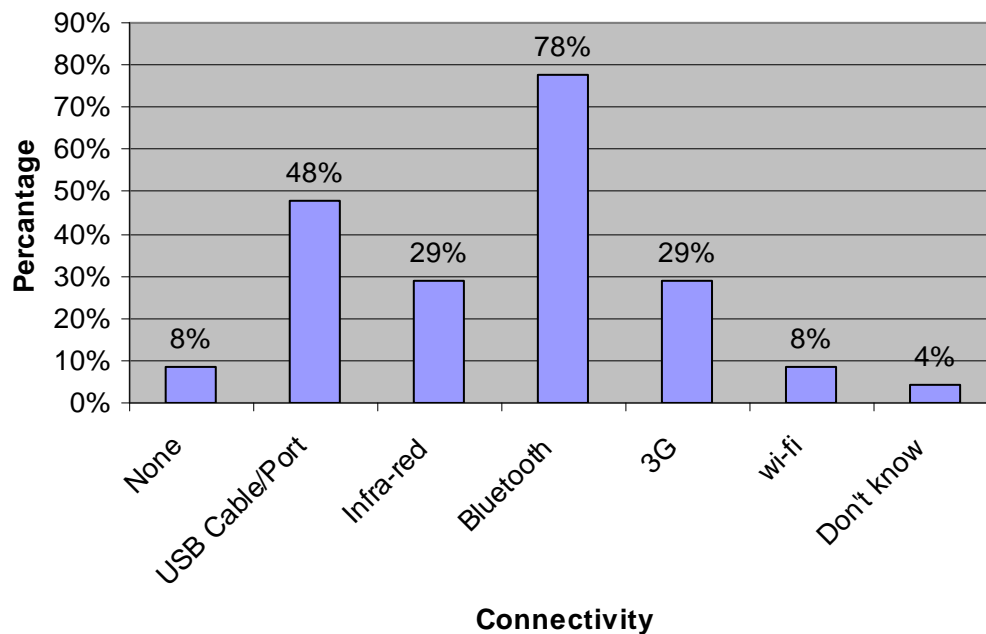
4. Do you use your mobile device to read/send email?

17%

4%

79%

☐ Yes ■ Occasionally ☐ No
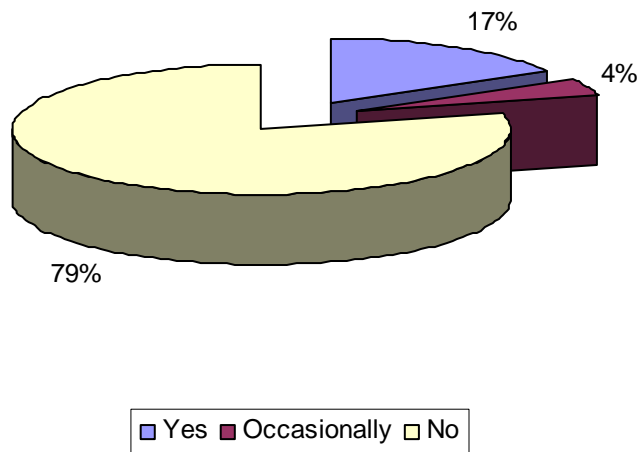
The majority of people do not use their phone to send and receive their emails.

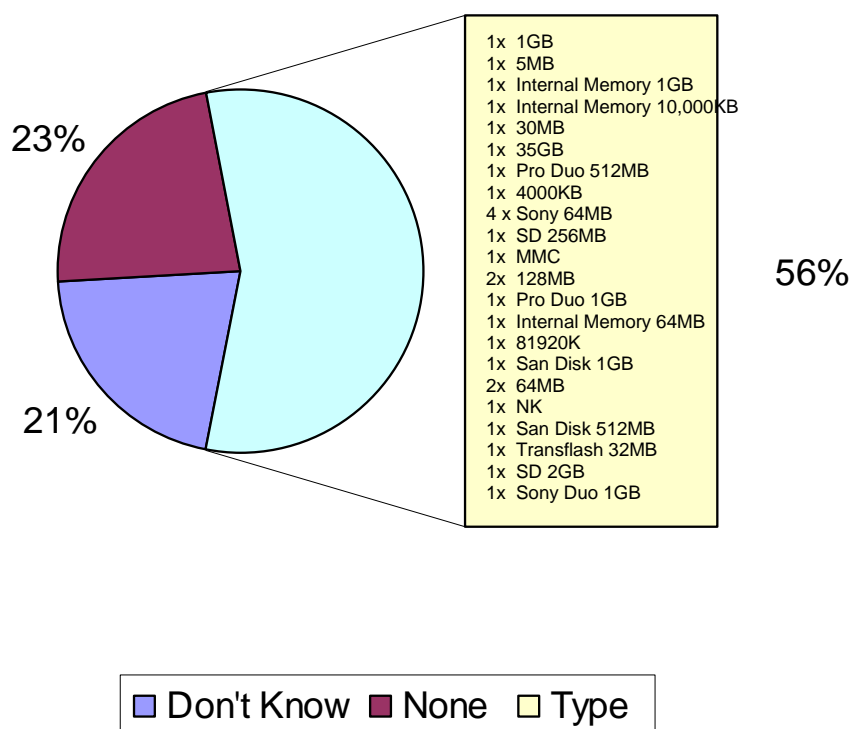Of the 79% who said no, 3% said they would if they knew how to.

5. What Connectivity does your phone have?

Connectivity

The vast majority of mobile phones are shown here to have Bluetooth capability, yet in Question 2, only 8% of people surveyed admitted to using this feature.
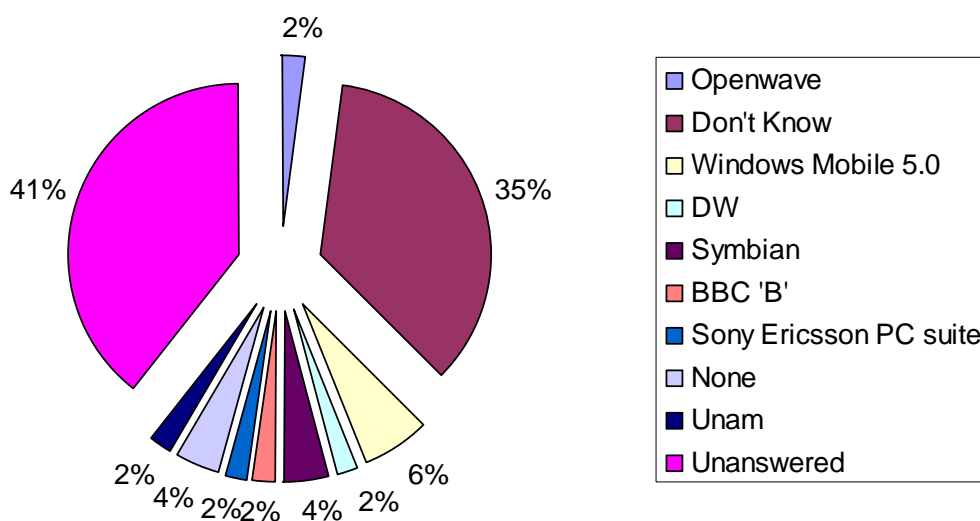
6. What memory card do you have in your phone? (Type/Capacity)

23%

56%

21%

|	
1x	1GB
1x	5MB
1x	Internal Memory 1GB
1x	Internal Memory 10,000KB
1x	30MB
1x	35GB
1x	Pro Duo 512MB
1x	4000KB
4 x	Sony 64MB
1x	SD 256MB
1x	MMC
2x	128MB
1x	Pro Duo 1GB
1x	Internal Memory 64MB
1x	81920K
1x	San Disk 1GB
2x	64MB
1x	NK
1x	San Disk 512MB
1x	Transflash 32MB
1x	SD 2GB
1x	Sony Duo 1GB

□ Don't Know ■ None □ Type

7. What software does your phone use?

Within the 'unanswered' section, it is unclear whether the phones do not use any software at all, or whether the owner is simply unaware of what software it uses.

2%

41%

35%

2%
4% 2% 2% 4% 2%

6%

□ Openwave
■ Don't Know
□ Windows Mobile 5.0
□ DW
■ Symbian
■ BBC 'B'
■ Sony Ericsson PC suite
□ None
■ Unam
■ Unanswered

8. What do you like best about your phone?

This chart shows the answers placed into rough groups - A more detailed breakdown of the answers can be found below.
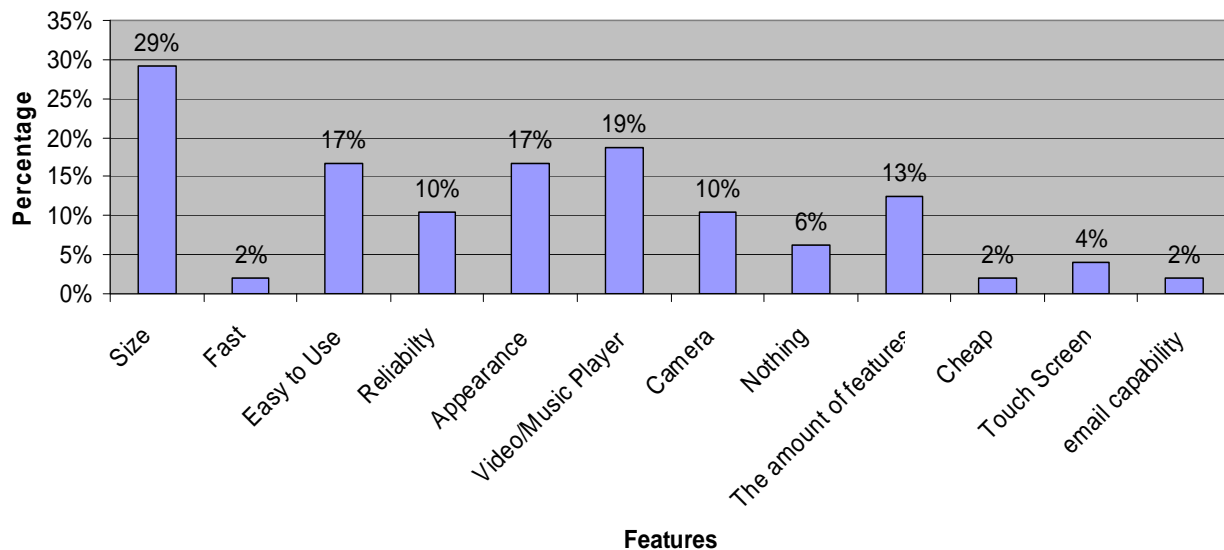
The 'size' column mostly refers to people liking how small their mobile is, and the fact 'it is lightweight', although one person did say they loved that fact that their phone was 'a brick'.

The 'easy to use' column also covers comments relating to the simplicity of the phone, people saying that they liked the fact it simply 'makes phone calls'.

Under 'reliability', a couple of people stated simply that they like the fact 'it works', whilst one comment was made of a Nokia that it was 'simple and indestructible'.

The 'appearance' column covers positive comments such as, 'the flip phone', 'its colour', 'the time is displayed on the outside', 'it is smart', 'the style', and 'the look'.

Under 'video/music player', all comments relating to those features are placed; 'it records music & video for an unlimited time', 'it can play music as a ringtone', 'it is an mp3 player'.

'features' is quite open ended as many people stated that they simply liked 'the amount of features' on their phone, 'everything' about their phone, and the fact that 'it does what I want'.

9. What do you like least about your phone?

This chart shows the answers placed into rough groups - A more detailed breakdown of the answers can be found below.
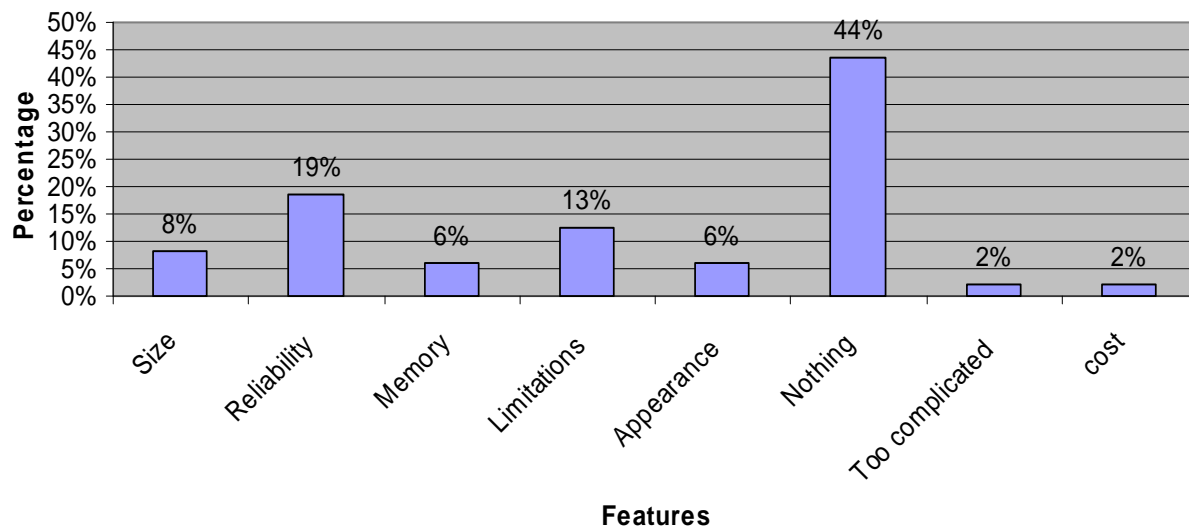
The 'size' column mainly refers to that fact that the phone is 'too big' or that 'it's heavy'. One person did, however, comment that their phone is 'so small I sometimes loose it'.

Under 'reliability', people noted that 'it sometimes freezes', 'the battery is rubbish', 'it crashes a lot', and that the 'signal plays up'. In this column, comments relating to features of the phone not working properly are also placed; for example, 'the camera has a poor picture', 'the Bluetooth is dodgy', and 'the voice recognition isn't working'.

The 'memory' column refers to the limited capacity of the phone, it 'does not enough memory' and 'it can't hold many texts'.

'limitations' also refers to the age of the phone, 'it is old and damaged', 'it has limited abilities', 'no Bluetooth', it is 'not very good or up to date', and 'it never works abroad'.

The 'appearance' column covers negative comments such as 'don't like the colour/look', 'it scratches easily', and 'I don't like the button layout'.

Under 'too complicated', people made comments about the 'confusing pc software'.

The 'cost' column refers to the expense of the handset, 'I had to pay for it'.

Other Mobile Devices

1. What type of mobile computing devices do you currently use? (Make/Model)

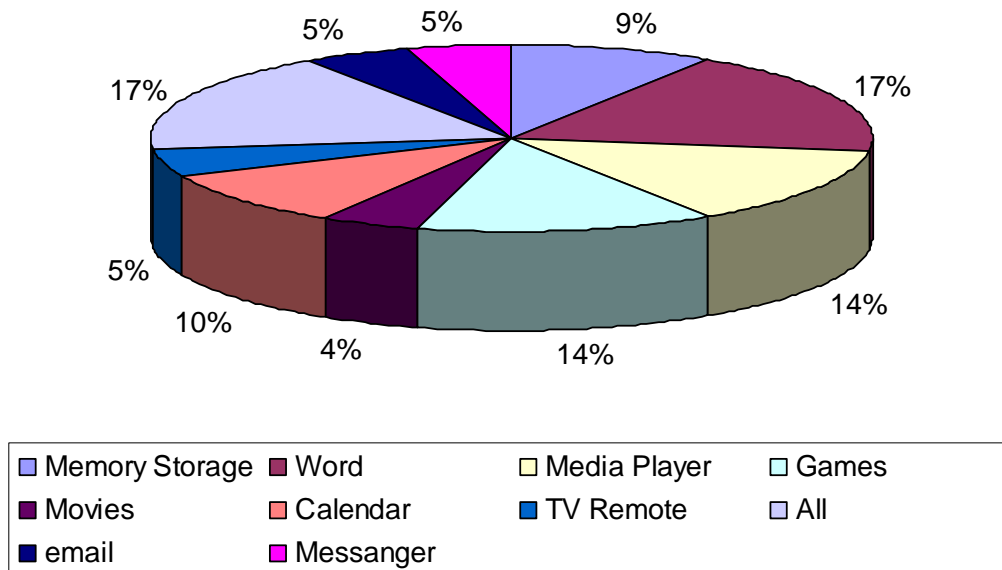Legend: □ None ■ USB Stick □ Handheld □ XDA 2 ■ PSP ■ PDA ■ Sony Laptop
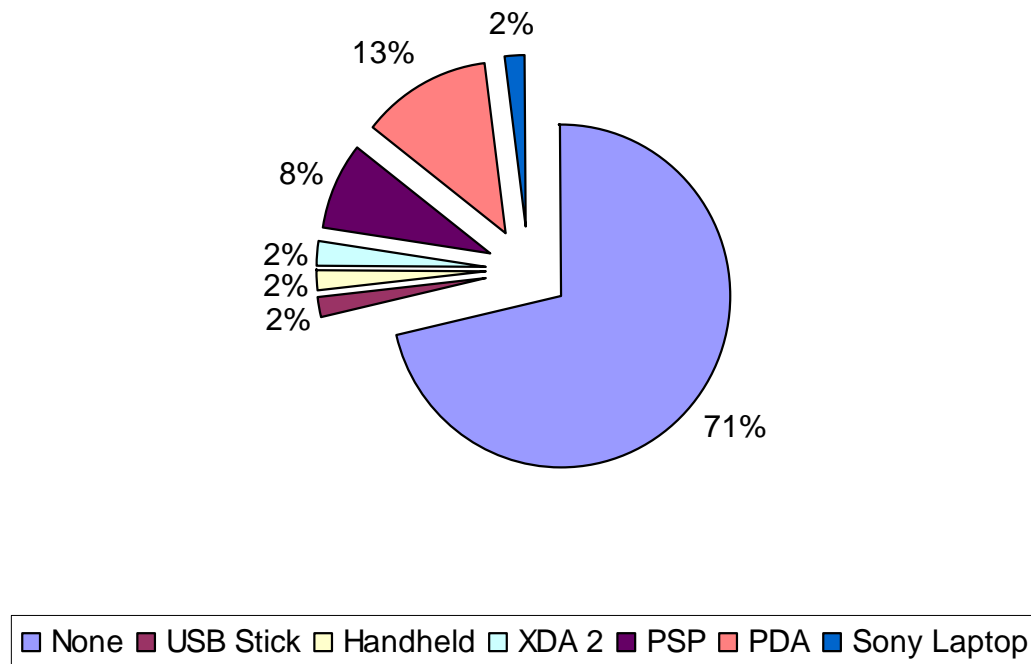
71% of all those questioned do not own any kind of mobile computing device, but of those that do, the PDA is the most popular device. Below is a list of the PDA devices owned.

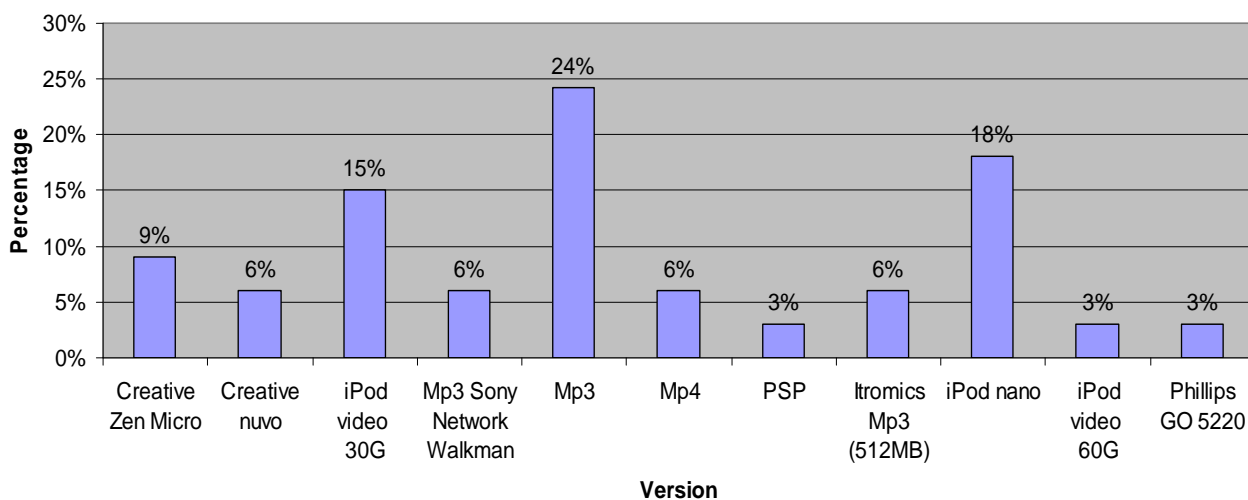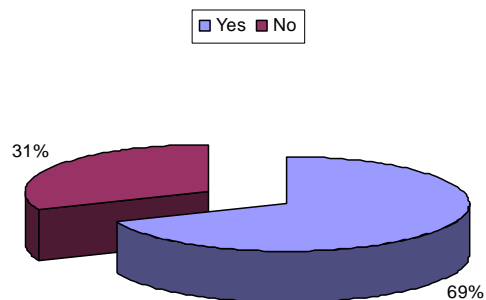| PDA Types	no.
PDA IPAQ 5550	1
PDA HP IPA r21700	1
PDA PalmOne Tungsten E2	1
PDA SPV phone	2
PDA Compaq	1

2 people use their SPV mobile phone as a PDA

2. What features of the device do you use?

17% of people who owned a mobile computing device replied that they used all of the features available to them, although did not stipulate what those features were. The next most popular feature used was Microsoft Word, closely followed by Media Player and Games. One person even used it as a Television remote.
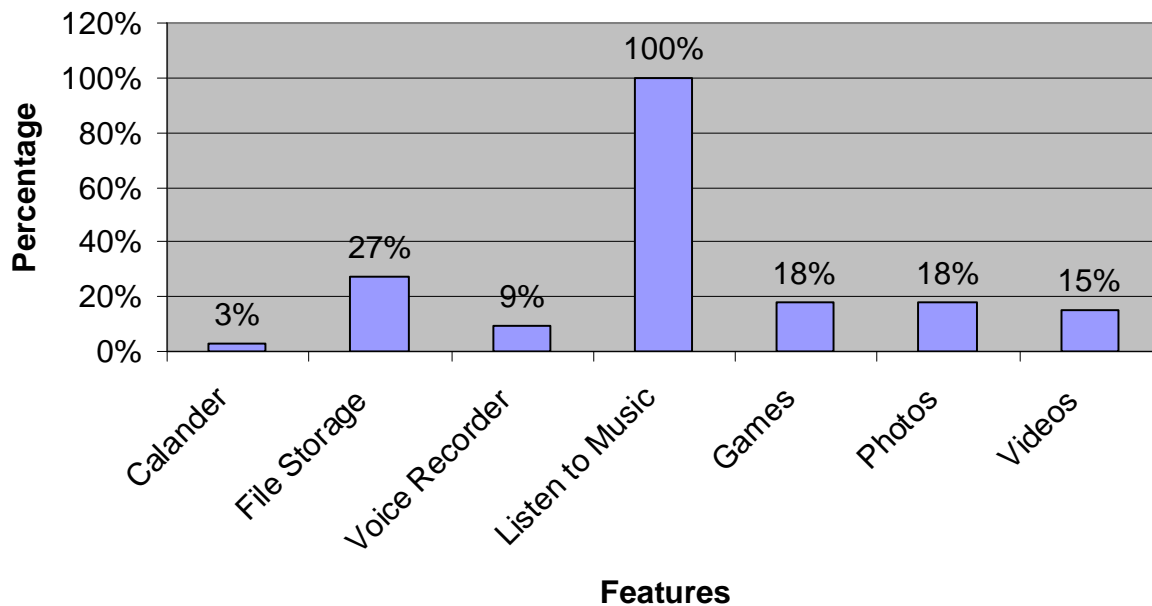
Legend:
- Memory Storage
- Word
- Media Player
- Games
- Movies
- Calendar
- TV Remote
- All
- email
- Messanger

Pie chart percentages: 5%, 5%, 9%, 17%, 17%, 14%, 14%, 4%, 10%, 5%

3. Do you have an MP3/4 Player?

Yes ■ No

69% of people asked said that they owned an Mp3 player of some kind. Of those, the breakdown of models is below: -

31%
69%

Percentage

| Version	Percentage
Creative Zen Micro	9%
Creative nuvo	6%
iPod video 30G	15%
Mp3 Sony Network Walkman	6%
Mp3	24%
Mp4	6%
PSP	3%
Itromics Mp3 (512MB)	6%
iPod nano	18%
iPod video 60G	3%
Phillips GO 5220	3%

4. What features of the device do you use?

Everyone surveyed used their Mp3/4 player to listen to music, this being the majority by a long way. The next most popular feature was file storage, followed by games, photos and videos, all very close together.

## 5. Do you download Podcasts?

The vast majority of people do not download Podcasts, but one person mentioned that they had considered downloading the News, and another said they would if the Internet connection on their phone was more reliable.

Of those who replied 'yes', one person mentioned that they actually host a Podcast.
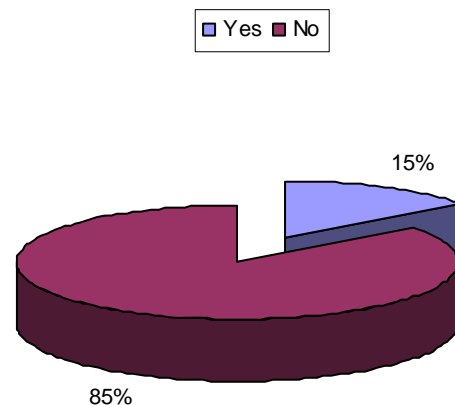
The Future

1. If you were to upgrade your phone what model/capability would you go for and why?

| ■ Don't Know	■ Nokia	□ LG	□ Sony Ericsson
■ Samsung	■ PDA	■ Motorola	□ Sony Walkman
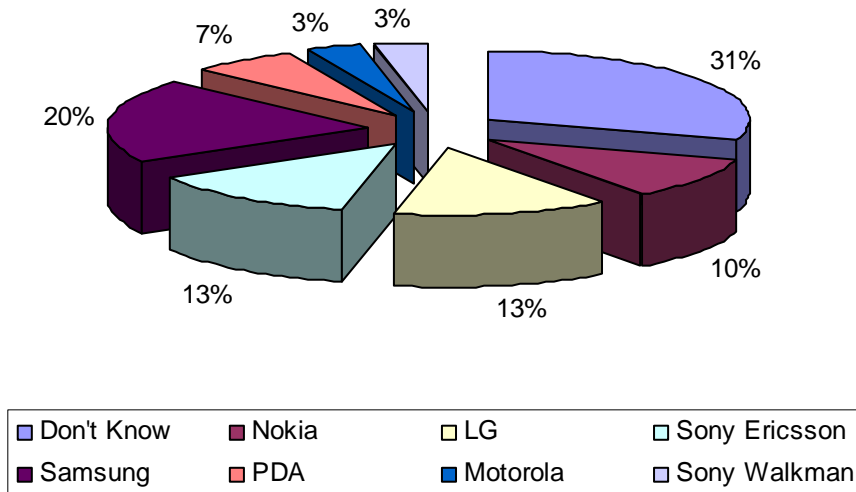
Most people questioned said they did not know what upgrade they would go for and of those that did, most just listed the name of the mobile phone. Some, however, were more specific in their choice of models, and the following were mentioned: Samsung D900 & E900, Sony Ericsson k800i and Nokia N90.

A table listing the reasons for their choice of upgrade is below:-
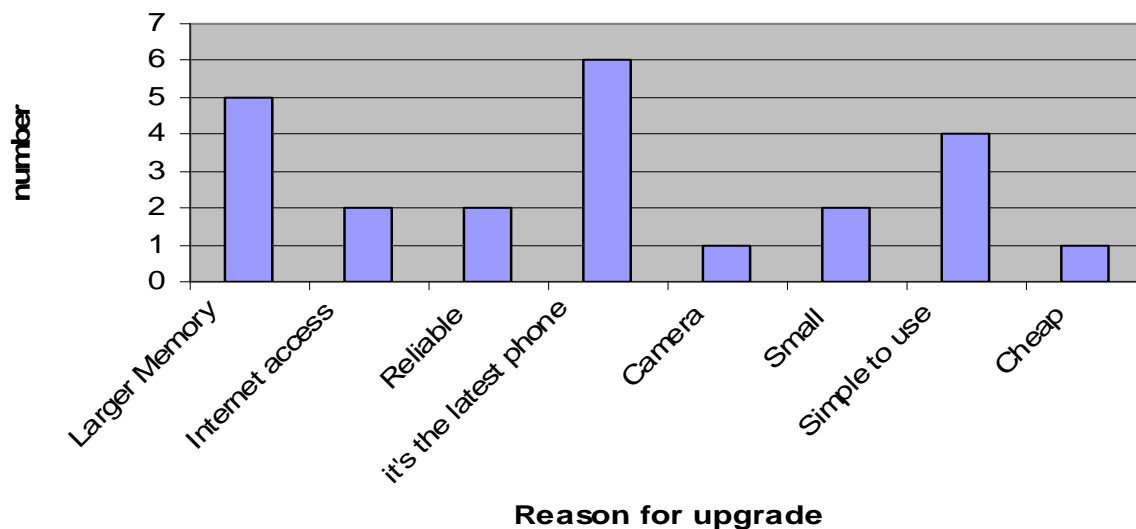
Most people seem merely concerned with owning the 'latest' phone, but apart from that, memory storage, simplicity and Internet access rank quite high.

2. If you were to upgrade your mobile device, MP3 player etc. what would you go for and why?
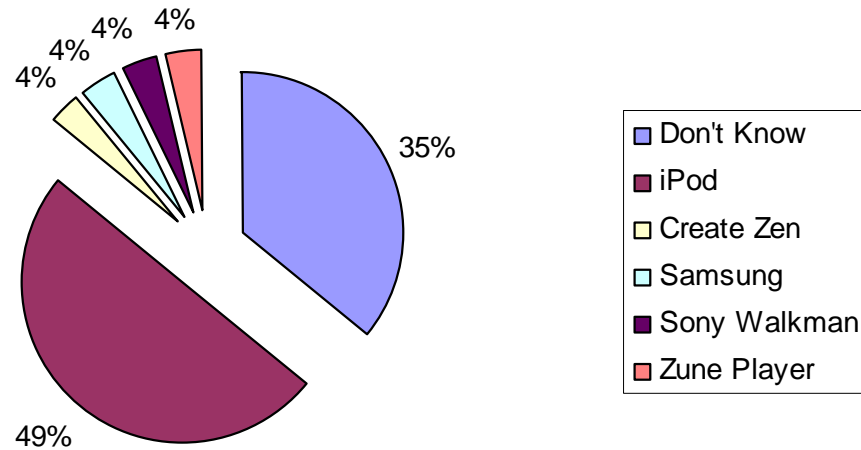
Almost half of all people asked would choose to upgrade to an iPod. Of those that weren't sure, however, 3 people stated that they definitely would *not* choose an iPod due to its unreliability and poor battery life.
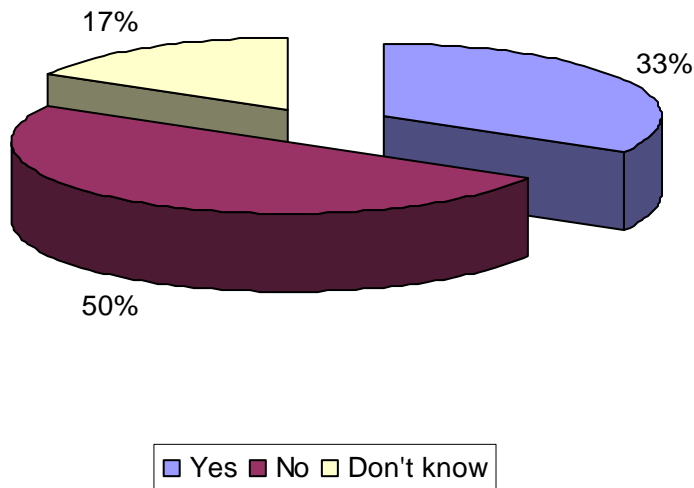
The reasoning behind upgrade choices is listed below:-
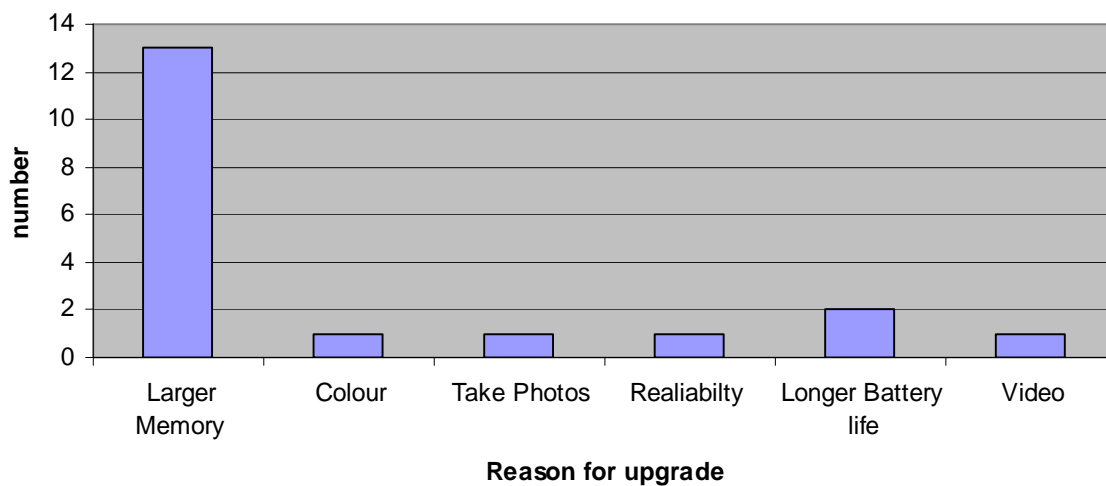
The vast majority of people are looking for larger memory capability in their mobile device.

3. Do you think you could use your phone and/or mobile device to help you with your studies? If yes, in what way?

Half of all those questioned either didn't want to, or didn't think they would be able to use their phone or mobile device to aid their studies.

Of those that replied 'yes', many came up some interesting ideas:-

➢ create and view Powerpoint slides, Exel and Word documents
➢ keep in contact/communicate with classmates and tutors
➢ to receive texts about assignments & deadlines / to keep track of them
➢ use photos for research
➢ use of Internet access
➢ for taking note and reading assignments
➢ to organise time better and to set deadlines
➢ to test the software we have created and to do research/help understanding into mobile phones

One person was very detailed in their response:

'Somehow! If in the future more and more devices will have a standalone ip address under the new iPv6, then you can use your mobile phone to store a server, then from your desktop connect to the ip address of your phone and see a particular webpage. Useful for networking classes. Also you could use the ip address of your phone in a ping test'

Of those that replied 'no', the comments were as follows:-

➢ too impractical
➢ I would not like to as I prefer the traditional methods, such as book and computers
➢ I would find it too distracting with all the other features
➢ No, and I hope I never have to!
➢ Only by turning it off before going into lectures

Data processed and interpreted by Helen Cook, research assistant

Interim Observations, Progress and Future Developments

The survey proved a useful exercise in ascertaining the sophistication of the technology routinely carried but not necessarily fully-utilised by our 'typical' HE learners. The latest generation of mobile phones in particular are clearly capable of providing access to online resources and communications tools and offer a variety multimedia and connectivity options. PDAs whilst not as ubiquitous as phones offer sophisticated organisational and communications tools. The consumer is now faced with a bewildering choice of options when choosing a phone or portable computing device and convergence of technologies and functionality means that 'it is becoming more difficult to differentiate between the available devices' (Trinder 2005). Irrespective of phone type or model it is likely that the majority of devices will be capable of acting as a useable platform for mLearning strategies as they are developed and trialled. Cost to the user e.g. for accessing the Internet, is of course an issue and this aspect of any new delivery system will have to be considered carefully.

This ESCalate funded project has proved to be a vital catalyst in promoting interest in the potential of mLearning within this institution and also stimulated a constructive dialogue with the University of Plymouth (of whom we are a partner College) who are themselves engaged in a major mLearning Project[1]. From September 2007 this college hopes to trial a 'wireless cloud' across the campus to facilitate the 'Push' model of mLearning delivery as outlined by Chris Kelly earlier in this report. How this new dimension to the college network will be exploited is still the subject of debate but it is highly likely that trials involving the use of mobile phones and/or PDAs will be developed and undertaken in the new academic year.

From the perspective of the need to develop the skills of Foundation Degree students in respect of mobile technologies, a key aspect of this project, colleagues have identified a range of programming applications deemed essential to improve the employment prospects of learners in this burgeoning field. Leon Glass in particular has been able to incorporate his recommendations outlined earlier in this report into modules written specifically for the new Foundation Degree programme in Enterprise in Computer Games Technology. The new award whilst primarily concerned with the development of computer games acknowledges that many such games are designed for educational purposes and are increasingly being delivered either on mobile devices (e.g. PSP, DS) or make use of collaborative internet connectivity play/learn scenarios. It is anticipated that a specific module on mLearning will be developed for use across our growing portfolio of HE Computing programmes as the practice is trialled and adopted within this institution. The module may also be of interest to colleagues who wish to

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[1] The Centre for Excellence in Professional Placement Learning at the university of Plymouth is currently running a series of trials using a variety of mobile devices (PDAs, mobile phones, iPods). Currently students undertaking Social Work, Podiatry and Bioscience degree programmes are involved in a range of trials designed to explore the scope of pedagogic use of mobile technology. The project is headed up by Matthew Newcombe, Senior Learning Technologist at the university of Plymouth.

explore the new paradigm in their practice as content will address appropriate pedagogies.

The author of this report has already delivered an in-house CPD event on mLearning with the intention of raising the profile of the technologies and practice methodologies which might be employed. The session was very well received and again the ESCalate project is acknowledged as providing the vital impetus for generating interest and enthusiasm in what will almost certainly become an important dimension to the strategies by which the college will widen participation and promote access to the curriculum in the near future.

The Project continues next term when it is anticipated that the above developments will be ratified and extended. A forthcoming dissemination event - JISC RSC South West: 'Getting the blend right – incorporating eLearning and technology into Foundation Degrees (SCAT 26th April, 2007) involves this author delivering a conference session on 'Meeting the needs and expectations of HE FD learners using learning technologies that support a blended learning approach to curriculum delivery' with acknowledgements to ESCalate and this project's focus on mLearning technologies and the HE FD context.

Stephen Rose
March 2007