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Podlearning: *Reality of a mobile learning method*

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Abstract

This project presents the study, implementation and evaluation of a mobile learning resource which is learner led. Initially, I will spend some time looking at the various users of the resource and then discuss the various components required to implement such a resource using a simple agile method. This method was implemented and evaluated on the staff and students of five courses at the University of Glasgow. I report the findings of the evaluation and conclusions on the success or failure of the method.

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“It is looking at things for a long time that ripens you and gives you a deeper understanding.”

Vincent van Gogh

1

Introduction

Vincent van Gogh is considered one of the great painters of our time. His works are renowned for creatively capturing the people and places in his life in a unique and emotional manner. The ability to capture a scene in such an elegant matter for the reflection of others is the brilliance of an artist. This notion escapes many aspects of modern learning.

A lecture is usually over within an hour and is interpreted by a student as frantic scribbles and symbols on a no doubt misplaced piece of paper. The desperation to document a lecture distracts from the students actual learning, not only is the student robbed of enjoying the original lecture, they are robbed of reflection - because of poorly written notes. It is arguable that this is part of the learning environment.

The learning environment of a student is dynamic, a day could consist of several locations, lecture theatres, seminar rooms, labs, study halls, lunch halls, bedrooms and living rooms. The time spent travelling between all of these locations - time spent on walking, cycling, trains, cars, and buses is vast and is often wasted. The environment is not static and so the tools for learning cannot be either, they need to move with a student, fit their needs, their environment, provide the student with the chance to reflect on their learning and allow better utilisation of time.

The tools for learning have evolved throughout time with chalk and tablets being replaced by pen and paper, the internet being spurred on by the revolution of the computer - with more and more information at the fingertips of a student. However, technology is still not capturing the ancient art of lecturing. Lectures are often a package of voice, slides and notes, delivered by the lecturer. There needs to be a way to bundle all these aspects and distribute them to a simple device that seamlessly shifts through such dynamic environments and actually allows a student, not only to

initially enjoy a lecture but to reflect and relive that learning experience, wherever and whenever they want, in order to deepen their own understanding.

This technology now exists. The new era of digital content is shaping and changing many ways individuals exchange information and how, when and where they experience it. Apple began this revolution with iTunes + iPod, five years later they are still the biggest innovators within the industry.

iTunes + iPod is a symbiotic partnership in the digital content industry and allows users to enjoy content in a simple and easy manner. It is the perfect platform to realise a true mobile learning system. iPod is an insanely popular digital device, which many students already own (see Section 6), it is simple to use and can allow students to enjoy and capture digital content anytime, anywhere. iTunes also offers the opportunity to distribute bundled digital content which actually encapsulates the essence of the learning experience in an enhanced and refined manner. iTunes much like iPod is very simple and fun to use and does not require any significant understanding to operate. iTunes is free and multi-platform, which means if a student does not own an iPod they can experience the same content with iTunes for free.

This is podlearning, the realisation of a mobile learning system which utilises the sophistication and beauty of modern distribution methods to enhance the learning experience of a student.

1.1 Literature Review

There is no established research field for my project. This is because podlearning is a new learning method using agile and modern technologies unlike anything that has been previously done before. The focus is on users, the staff and students and ensuring that the technology used fits their lifestyle. The method is elegant in its design, it is organic and only grows with help from both the teacher and learner otherwise the method dies, fades away. It is similar to the use of lectures as a learning method. If a student does not attend a lecture, they miss the content from that lecture. If a student does not ask a question, they will not get an answer. If no student is willing to loan a lecturer their iPod, they do not get any digital content - pure and simple. The technology has to be simple as not to alienate staff and students, they are needed to make this flourish.

Podlearning is the first step on a (hopefully) long road to podcasting in education. Podcasting is relatively new and many individuals are still finding their way with the content, even giants like Apple. This project is challenging new technology with new ideas, which makes this project the ideal base for future work.

That isn't to say that individuals have not explored other aspects of podlearning, such as mobile user interface design, understanding mobile contexts and capturing content of a learning session. There are many companies and individuals researching many aspects of mobile user interface design, these interfaces are difficult because of resources, space and the numerous environments they shift through. Dr Brewster has highlighted some aspects of this difficulty in his research and how to achieve the best results with limited resources [10]. There are also several companies such as Creative[16], Sony[43] and Apple themselves[7], who spend billions trying to construct the best user experience

and battle over who owns it [41] [33] [11] [45].

User interfaces are coupled to context. There is a lot of effort focused on understanding mobile contexts. Temminen suggests that there is a need to maintain personal space using the systems around us and talks of the notion of *'hurrying'* and *'waiting'*. Individuals may have an overall task to achieve, say getting to a lecture on time. They hurry to achieve it, paying only attention to (it is suggested) time and space. An individual can end up waiting from hurrying too much and might break in an activity - such as having a coffee, but the main goal is getting to a lecture on time [21]. This is obviously an important consideration within mobile devices as successful designs are able to shift between contexts.

Capturing the content of a learning session in the first instance is also an area of great research with many groups looking at elegant ways to capture content. There have been several solutions developed such as STREAMS [17], Rendezvous [1], DEBBIE [9] and eClass [12]. Brotherton's eClass is one of the more recent longitudinal studies which attempts to capture nearly every aspect of a learning session through media (i.e. audio, video, web-pages, slides, notes etc) and presents them to the user as a unified whole, in the form of a webpage. The webpage is meant to be a way for the student to relive and enjoy the learning session anytime they wish for whatever purpose. Brotherton's capturing solution utilises complex modern technologies in order to capture content but ensures this doesn't infringe on the teacher or learner. Brotherton's attempt, is similar to my own in focusing strongly on the user of the system. A system can have 101 amazing technologies but if it does not have the backing of the lecturer and student then the system will die through lack of content, which is why they are essential in the development of any learning system.

The concepts of user interface design, context and agile capturing within my project are solved with one device: iPod. A popular consumer electronic, this is why my project is one of the first in a new field - podcasting in education.

“Technology frightens me to death. It’s designed by engineers to impress other engineers.”

John Cleese

2

User Scenarios

John Cleese is an intelligent and brilliant actor, yet he is frightened of technology[39]. Unfortunately, this is common place within the modern world. Those who introduce technology often lose sight of the end users of the product. How this technology will work and how it will fit the everyday lives of individuals, as opposed to the individual fitting the constraints of technology must be the key consideration in order to prevent frightened and frustrated users. This does not only apply to digital music players or high definition televisions, but dishwashers and washing machines (some manufacturers are still failing to create elegant interface solutions for these common domestic appliances[30]). Alienating the user of any product is folly, it is naïve to think simple visual appearance automatically equates elegant simple interaction, it is often an indication of reduced manufacturing costs[46].

There are many designs that are implemented which encompass many constraints, some designs are produced and are maintained through legacy, through fear and expense of change rather than being efficient methods. A prime example is that of a computer keyboard layout, modern computers use keyboards based on the QWERTY design sold to Remington in 1873[18]. This design was optimised for typewriters, in order to prevent typebars from becoming intertwined and stuck, destroying the paper within. There is no need for this design on a computer(due to the lack of typebars) especially when keyboard layouts such as Dvorak Simplified Keyboard arrangement offer better speed and efficiency[18]. However, cost and training has prevented alternative designs from becoming common place, even though they are more efficient [15].

There are others that would argue that the legacy QWERTY interface is merely an example of Technological

Momentum [20]. Technological Momentum is a theory by Thomas P. Hughes regarding the relationship between technology and society over time. The theory revolves around two factors, *technology determinism* and *social determinism*. Technology determinism is when society is changed by technology, an example would be the design of cities in America, in that they were influenced by the introduction of the automobile. When this happens - adoption and expense ensure changing methods is not easily done. Social determinism, is when society controls technology, such as when Americans rejected nuclear power because of the Three Mile Island incident [58]. Hughes argues that technological momentum is the relationship between these two factors over time and that all technology begins with social determinism, but through use and acceptance becomes entrenched within society and becomes technology determinism [26].

In either case, it is essential to consider the user of the mobile learning system, those who are expected to access and utilise the content and also those who will be expected to produce and distribute the content. After spending four years studying at the university and time talking to the staff and students on the courses that podlearning will be piloted on, I have assembled some scenarios of the users who the system is intended for.

Using these scenarios, I give three depictions of the expected users of the system.

2.1 User Scenarios

2.1.1 Miriam

Miriam is a dedicated student at the University of Glasgow, she lives a long (yet not unusual) commute away from the campus and spends approximately three hours everyday travelling everyday on tubes, trains and buses. It is often her solution to drown out the surrounding chatter with her iPod on these long commutes.

While travelling she enjoys an extensive and eclectic mix of digital music that she has gathered over the past year. She has also subscribed to several podcasts - mainly BBC ones - to enjoy in her home and on the move. She herself has commented on the white army of iPod owners which are heavily present on public transport and how iPod is akin to the lifeline of a magazine or book.

Monday, Miriam has one two hour lecture, she decides she is going to clarify some topics, she connects her iPod to her computer before going for a shower. While in the shower iTunes + iPod syncs her digital life by ensuring all her content is in sync and that any new content such as a lecture is put on her iPod.

Frantically, she gathers her notes and books, grabs her iPod and some toast in a desperate attempt to catch the bus. She is successful in her quest and as she sits on the bus, looking through the content on her iPod a small blue dot on the screen indicates a new lecture has been downloaded. She sits and listens to content in preparation of the upcoming lecture.

2.1.2 John

John is another student at the university, unlike Miriam he lives but a short walk from the university and has no need for an iPod. He also does not feel the need to own a personal computer connected to the internet as the university possess thousands of them and is a few minutes away.

The flurry of interest surrounding the fashionable term of podcasts has captured John's imagination and he decides to spend sometime investigating what this system has to offer. He leaves earlier than usual and makes his way to the university library where he borrows a pair of earphones from the front desk and logs onto the podlearning website.

Using the notes he has gathered from the lectures and ones he has written himself he sits and listens to the content straight from the podlearning website and reminds himself of the discussions that occurred during the seminars. He scribbles down some ideas to clarify with the lecturer later that day.

2.1.3 Susan

Susan is a lecturer at the university, she has often held a thirst for technology in helping her students to do their best within her course, she is an avid fan of Moodle (virtual learning environment at the university) and believes mobile learning will allow her students to make better use of the time they waste on the move and also allow them to carry the course in their pocket.

Susan herself is more than willing to participate in the project but emphasises she does not own an iPod and is confused about how such content will be captured. She is keen to ensure an exceptional learning experience for her students and that their learning experience will not be hampered by elaborate recording and distribution. She wants to ensure capturing of content is painless and that students are aware of when a recording happens but that the awareness does not inflict on their learning experience.

The simplest solution is to use an iPod equipped with a recording accessory. Susan simply asks for the loan of an iPod from a willing student to capture the content.

The white wire of the lapel mic allows students to see that the lecture is being captured, much like the white headphones allow individuals to see content is being enjoyed. The willing student who provided the iPod will later upload the content from the iPod to the university servers, where Susan will distribute the content via a podcast to the students of the class.

2.2 Learner led ecosystem

This delicate system of students and staff represents a truly learner led learning system that maintains the fragile symbiotic relationship between teacher and learner. If no student provides an iPod then the content will not be captured, ergo not broadcasted, much the way if a student does not attend a lecture - they lose the experience.

The capturing of content is not elaborate, it is a simple combination of already present devices with a cheap

accessory. The white wire which connects the lapel mic to the iPod provides visual awareness of capturing and allows students to see what is being captured and when. They do not need to ask the lecturer if content is being captured.

This means that both parties are dependent upon each other and it allows classes to forge their own unique learning experience, if students do not want this sort of digital content, then the lack of willing iPods will kill the system. If they find the recordings are of no use or they can develop other learning techniques - then once again the recordings will waste away to nothing.

The process is organic, if teachers and learners find the content to be useful the more powerful and numerous the content will be, it will grow and more individuals will participate - creating a lively and rich digital world which paints a rich tapestry of a course.

This, therefore means the mobile learning system reflects the effort and desire of the user through devices that are popular and plentiful. If the users involved are frightened of the technology then it will wither and die and they will continue with traditional learning paths. If the system is simple and elegant and offers new learning opportunities then it will flourish and grow in line with interest and use from users.

"I work in whatever medium likes me at the moment."

Marc Chagall

3

Bundling

Marc Chagall was an amazing artist, he often took inspiration from his roots but his work often found itself within emerging trends. Chagall was able to utilise new media in order to express himself to the world. This use of medium was critical in expressing himself to others, ensuring others could grasp meaning and insight from his work.

Lecturers express themselves through the medium they use, this is usually their voice combined with handouts, some overheads. Through the centuries the media has evolved where a lecturer previously might have used a blackboard they now use a technological medium such as Microsoft PowerPoint. Technology such as PowerPoint isn't so much technology as in digital projectors and laptops but rather a new process, a new way of doing something, new technology [23].

However, even though numerous lecturers might use PowerPoint, others do not and decide to still use the old fashion blackboard or pencil and paper, this is very true of the mathematics department at the University of Glasgow. In reality, although the medium for learning has evolved they have not replaced their predecessors.

It is common for evolved media to replace its predecessors completely, such as records were replaced by compact discs, compact discs are becoming replaced by digital music. This is usually because the new medium represents some significant benefit over the predecessor.

However, more traditional media in learning has not faded away but acted as a complement. The various media used within learning complement each other rather than replace each other, this ability to complement seems to turn a new medium into a lasting one. A lecturer might use PowerPoint for the main lecture, the blackboard for discussion

and put additional content on the course website - all in an attempt to help students understand a topic better. No one single learning medium has replaced another.

A lecturer, utilising all these different media is ensuring successful communication of a concept with as many students as possible. The digital frontier is opening up before lecturers, they need to tackle it and embrace it, if it represents a valuable medium to learning.

Podcasting in education represents an elegant way to embrace digital content. Podcasting allows for the **bundling** of content and distributing it to a user as a package. The power of bundling, beautifully illustrates what already happens within learning, the complement of various content combined into one vision for the enjoyment of the learner.

Chagall said “*All colors are the friends of their neighbors and the lovers of their opposites.*” [48]. If colours are the various media of learning, an artist is using colours in order to express their vision, the same way a lecturer is utilising the media in order to teach their students. The various colours when applied properly produce an elegant and attractive piece which conveys the artists intentions for interpretation of others, the same way the lecturer will attempt with the utilisation of various content.

The artist has the canvas to hold their expressions, timelessly trapped for endless evaluation of others. The lecturer, only has a few hours a week to communicate with students. The lecturer really needs a canvas to embody all the media they want to use. Podcasting is the canvas for lecturers.

Lecturers can bundle audio, notes, slides, documents, video, photos etc in one podcast. The concept of bundling all this content together and allowing it to interact, creates a virtual learning platform which acts as a complement to the original lecture. This means that a student can enjoy the learning experience rather than frantically writing notes. If they **need** to clarify a point they can relive the lecture at another time, in another place of their choosing.

“Good artists copy; great artists steal.”

Steve Jobs

4

Implementation

Steve Jobs is famous for (mis)quoting Pablo Picasso, these famous words were the pinnacle of Apple’s culture during the early eighties as the ‘*pirates*’ of silicon valley [13] [60] [44]. Apple have been around for a while and will soon celebrate their 30th anniversary, 30 years of innovation, success and failure.

Apple has become the king of the intangible, it not only has the most popular digital content store in the world with iTunes [28] it also has the most popular digital content player with iPod [4]. The key to Apple’s success is in the company’s elegance in hiding overwhelming complexity under a veneer of style and simplicity.

The digital content realm is a complex puzzle with many pieces, if you assemble those pieces incorrectly, then the final result will look disjointed, messy and serve only to highlight the composing components. However, if you assemble those pieces correctly - a wondrous picture appears composed of components you can no longer distinguish. Apple has achieved this in the digital realm with iTunes + iPod, they have put the pieces together correctly, were others such as Sony and Dell have failed [38] [8].

Therefore, in developing a mobile learning system the correct pieces have to be identified and assembled correctly, in order to enjoy the solution, or rather a student should be able to enjoy digital content for learning without knowing the comprising components.

4.1 Jigsaw Pieces

The pieces in our puzzle are the **iPod**, **iTunes**, **Extensible Markup Language**, **Really Simple Syndication**, **Advanced Audio Coding**, **Advanced Video Coding**, **Podcasts** and **Enhanced Podcasts**.

4.1.1 iPod

Steve Jobs announced iPod on the 23rd of October 2001 as part of Apple's digital hub strategy. There is much debate about the creation of iPod [32] but the principal designers were Tony Faddell and Michael Dhuey [55]. The product was initially met with great scepticism by the Mac community, many felt it was the wrong direction for Apple to take in their fragile state [29]. However, it is now 2006 and iPod is the most successful digital player in the world with a 78% market share [4], its biggest competitor being SanDisk with a 3% market share while companies like Dell have pulled out of the market, in an effort to streamline their products [8]. Apple to date have sold 42 million iPods [6], 32 million of those in 2005 alone [4], 14 million of which were sold during the Christmas period. This means Apple sold more than 100 iPods every minute of every day during the Christmas period and still didn't have enough to meet customer demand [4].

iPod has been a unabashed hit for Apple and has generated a rich and wealthy iPod ecosystem of accessories, which is estimated at a \$1 billion value. The success of iPod has infiltrated culture - research shows that iPod owners are deemed as '*product innovators*', that they are more likely to capture, create and cascade digital content through the internet [14]. iPods are also owned by the Pope [25] and the Queen [2]. It is been recently suggested that iPod is the Kleenex of MP3 players, in that it defines its category - it is hypothesised modern culture will drop the term MP3 player and go with the popularised iPod brand to refer to digital audio players in the future[51]. iPod's massive success is surely down to its stylish appearance combined with it's simple and intuitive interface.

Jobs states that "*Most people make the mistake of thinking design is what it looks like... That's not what we think design is. It's not just what it looks like and feels like. Design is how it works.*" [49]. This thinking is clearly displayed in the user experience of the iPod, the beauty of the user experience is making a wealth of content accessible in a few clicks, every action is undoable, there are only four buttons and a click wheel. The buttons are large and intuitively placed allowing iPod to be controlled with one hand. Apple's minimalist design is ideal in a mobile world. It is clear that deep thought has been given to the user experience and knowledge has been drawn from user interface ideals laid out by Nielsen Norman Group and Bruce Tognazzi - vanguards in user interface design [47] [24].

iPod's popularity and simplicity ensure it is an ideal device for a mobile learning platform.

4.1.2 iTunes

Apple iTunes was released on the 9th of January 2001 (before the Apple iPod). iPod support was added to iTunes the day iPod was announced and acted as management software for iPod and other music players. The 28th of April 2003 saw the addition of the iTunes Music Store. The iTunes Music Store was the first online music store to gain

widespread attention, the store allowed users to purchase individual songs and listen to them on iTunes and iPod[31]. The purchased content could not be listened to on any other player besides iPod thanks to Apple's FairPlay technology (i.e. digital rights management)[52]. This system essentially locks users to iTunes+iPod, since FairPlay technology is not licensed to any third parties. This has been of much debate lately, France and Denmark are set to force Apple to open up their digital right management (**DRM**) to other parties in order to prevent a monopoly [37]. Apple's response was "iPod sales will likely increase as users freely load their iPods with 'interoperable' music which cannot be adequately protected. Free movies for iPods should not be far behind in what will rapidly become a state-sponsored culture of piracy." [35].

Apart from some glitches, the iTunes Music Store was a runaway success and sold more than 1,000,000 songs within its first five days, the store now sells more than three times that amount in a day. Apple announced on the 23rd of February 2006 that it surpassed 1 billion songs in under 3 years, compare this to McDonalds who took over 8 years to sell 1 billion burgers [5]. Apple is now forecasting expected annual sales of 1 billion [6].

iTunes has been a phenomenal success for Apple. iTunes was a late entry into the media market after players such as Windows Media, Realplayer and Apple's own QuickTime. Apple iTunes is now the fastest growing player of the four, already surpassing QuickTime and soon to overtake Realplayer. Although Windows Media Player has 80 million unique users compared to Apple iTunes 30 million unique users, iTunes is enjoyed over twice as long as the two main competitors - on average each user spends 46.4 minutes with rival players while users spend 111 minutes with iTunes. This in part is due to the phenomenal success of iPod and media such as podcasting[50]. The iTunes Music Store is the second biggest online store and the biggest digital content store in the world with over 10 million unique accounts (with credit cards). In 2005, traffic to iTunes grew by 241% from 6.1 million to 20.7 million, this means that 14% of the internet's active population - use iTunes[36]. iTunes is also outstripping sales of music in traditional outlets such as Borders [34]. It is clear to see iTunes is becoming a big player within industry and with its popularity sky-rocketing it is clearly becoming the most popular choice among users already.

iTunes is a free multi-platform digital content client software which will allow users to enjoy our content.

4.1.3 Extensible Markup Language

Extensible Markup Language (**XML**) was the work of Jon Bosak and many others, with the backing and financial support from many large companies within the computer industry including Microsoft and the W3C [59]. Jon Bosak argued that the Standard Generalised Markup Language (**SGML**) could potentially solve future concerns of distribution using the world wide web. Bosak suggested that a version of SGML should be defined for the world wide web and requested that W3C fund or research such a standard. Eventually, Bosak was asked for such a standard - in 1996 by the W3C. It was not until February 1998, after twenty weeks of intensive work and a working group of 11 and an interest group of more than 150 individuals, who never met, that XML 1.0 was recommended as a standard by the W3C [59]. XML 1.0 is a subset of SGML and achieved the primary goals of the working group, including SGML compatibility, easy authoring, adaptability, conciseness, validity, minimisation, formality etc.

XML relies on a tree structure to describe data. This meaningful structure and use of semantics ensures that it is understood not only by machines but humans as well. An XML document is essentially text, which uses markup language to construct elements which in turn are made up of attributes of character data. XML can be applied to almost any area of data, in order to do this XML relies upon a Document Type Definition (**DTD**) a DTD is used to describe the *language* used within the XML document, i.e. the elements/attributes within the XML document.

XML represents an elegant information interchange standard between entities that can be understood by humans. This means XML can be used to describe content, such as audio and video. XML could be utilised to describe interaction between content, such as at 23:02 minutes display a picture of a book.

This open standard is an excellent way to describe content that can be interpreted by numerous systems rather than one particular platform and simple enough to be integrated into other platforms and projects.

XML will be used to describe content integration and interaction.

4.1.4 Really Simple Syndication

Really Simple Syndication (**RSS 2.0**) is a container format for content that is specified in XML and is used for web syndication. The concept of web syndication is making content available to other entities. These entities can be anything from another site to a regular user and the content can be anything from text to video.

The key concept here is aggregation of content from multiple sources, aggregation can take the form of a website or an application. It is possible to build a website that collects daily news syndicated from news agencies such as the BBC or CNN. This allows a user to visit one site for the news gathered from various sources, rather than visiting various sources and viewing various adverts. An even better solution is to develop an application were a user can specify various news sites, every time that application is initiated it will collect the news from the user specified sources.

This means that various digital content can be hosted by multiple entities but the content can then be syndicated through RSS and then the content can be aggregated by an application, to present the content as a unified whole rather than various components. The entire process of publishing and aggregating is done without the user knowing, all the user sees is the unified content.

RSS will be used to syndicate digital content.

4.1.5 Advanced Audio Coding

Advanced Audio Coding (**AAC**) or **MPEG-2 Part 7** was developed by the MPEG group which includes Dolby, Fraunhofer, Sony, Nokia and AT&T. AAC is intended as a successor to the ageing MP3 standard. The benefits of AAC over MP3 are higher quality audio with smaller file sizes, support for multichannel audio, up to 48 full frequency channels and sample rates of up to 96 kHz. AAC is far more efficient to decode than the relic MP3 standard, hence requires less power to decode. Thus, AAC makes less demands on a device's resources (which is crucial in mobile devices).

The sound quality is far superior, experts at Dolby Studios have deemed AAC audio to be '*indistinguishable*' from the original audio source [3].

These characteristics make AAC the perfect choice for distribution of digital content for enjoyment on mobile devices, the higher quality is perfect for maintaining crisp clear voices, smaller files sizes reduce the amount of time spent by a user downloading the file and the efficient decoding process reduces demands on mobile devices, such as iPod.

However, although AAC is popularised by iTunes + iPod and a significant number of modern mobile handset from Nokia and Sony Ericsson it is still not as heavily recognised and supported as MP3s. There is also some confusion among users concerning AAC file formats, some feeling that it is an exclusive Apple based standard due to Apple popularisation of the standard. When in fact AAC is an open standard accessible to any entity.

Therefore, in order to entice confused users or aid those individuals who have different audio devices unable to play AAC files, the files used within the podlearning project were made available for download in MP3 from the podlearning website.

It is important to iterate the small size and quality of audio encoded with AAC. AAC is vastly superior to MP3 at a determined file size, for example - one file used within the project is 58 MBs in MP3 format, the same file in AAC format (optimised for spoken voice) is 25.6 MBs. AAC is more than half the size, sounds better and makes less demands on resources. AAC can also be combined with other standards such as XML, to create interactive content, whereas this is not possible with MP3 audio. It is clear then that AAC should be promoted and utilised, rather than only using the MP3 standard.

Advanced Audio Coding will be the encoding of all audio content used in podcast. Since AAC is a relatively new standard, the audio will also be made available in MP3 format.

4.1.6 Advanced Video Coding

Advanced Video Coding (AVC) or **MPEG-4 Part 10** is a digital video encoding standard developed by the Joint Video Team (a partnership between the ITU-T Video Coding Experts Group and the ISO/IEC Moving Picture Experts Group). The creation of AVC was an attempt to create a standard that was capable of providing high quality video at lower bit rates than previous standards, which could scale on several devices with differing capabilities from mobile phones to high definition televisions without enormous resources. The result is a standard similar in nature to AAC, that is higher quality video at a smaller file size [3].

The AVC standard has been adopted by both future high definition DVD makers and by future high definition digital broadcasters such as Sky[54]. Similar to AAC, Apple has taken the lead with the standard and was the first to popularise AVC through Quicktime, Mac OS X and applications such as DVD Studio Pro [53]. Apple's 5th generation iPod is capable of playing AVC and the video for sale within the iTunes Music Store is AVC rather than traditional standards such as MPEG-4 Part 2. Apple's argument for using AVC is once again higher quality video at a desired file size.

Although video is a far more complex beast than audio there is much debate about choice of standards by Apple. AVC is a far more efficient standard but consumes a far greater amount of processing power than traditional MPEG-4 Part 2 to operate. This means that mobile devices (and most modern desktop systems) will struggle to decode AVC videos at a high aspect ratios without significant resources. There is also the concern of scaling from device to device, a video encoded to the dimension of an Apple iPod screen (320 x 240) may look excellent, however scaling that same 320 x 240 movie to a high quality laptop screen of resolution 1440 x 960 and you see a significant drop in quality. The simple solution would be to produce a video to the dimension of 1440 x 960 with a higher bit rate that could then be scaled to the iPod's 320 x 240 screen. The problem here is the demands placed on the iPod to decode video at such a scale would require a dramatic amount of resources which the current iPod does not possess (neither does the laptop with that size screen). Furthermore, even if Apple was able to release an Apple iPod which could actually decode video at such high aspect ratios, it would take several hours to download on a fast internet connection (≥ 10 MB) and would require significant storage.

The problem that faces Apple and others is that they can offer you a orchestral audio experience in the subway, but not a cinematic one. The numerous considerations tied to video mean it's inherently more complex to produce, distribute and use when compared to audio.

This means that unlike capturing audio from lectures with a iPod, video requires far more sophisticated and powerful technology. The capturing is not a grand hurdle when compared to the actual distribution which will require further thought, of where, when and how the content will be enjoyed. The quality, length and scale of the video will reflect heavily on its size, this is true of any digital content - but video already has large files at small scales and dramatically increasing sizes as scale grows, which could lead to unrealistic file sizes for distribution.

Apple's choice of AVC video at a ceiling of 768kbps and a aspect ratio of 320 x 240 [56] is exquisite on an iPod screen (320 x 240) and is of acceptable complexity to be decoded by the iPod's resources and small enough to be realistic for download, that makes these choices work for iPod. They also work for enjoying video on a standard definition television set - the video scales quite nicely - which is acceptable in the current climate of standard definition televisions [57]. The choices also make sense when capturing video since some low end digital video cameras and web cameras already natively capture AVC in 320x240 aspect ratio (i.e. Apple iSight). This means that by using an iSight video camera, capturing content really only requires a laptop with an iSight and this makes producing video for distribution on mobile devices much easier.

This is the model used within the project, video is captured using an iSight and a Apple PowerBook. The iSight camera is positioned to the desired location and content is captured. The video produced is of surprising quality for a file of such a small size and because of the small size it is realistic for download. The video is also of low enough complexity which means it does not make heavy demands on resources. Perfect for the project.

Time was spent investigating video because it does represent a growth market and advances in the relevant areas will make it easier to work with, in the project focus was placed on audio and in perfecting it, rather than tackling video at this earlier stage.

Video within the project will be encoded in AVC with the baseline profile, the video will also be available in MPEG4 format as this is commonly supported.

4.1.7 Podcasting

Podcasting is the distribution of digital content over the internet using really simple syndication (**RSS 2.0**) for enjoyment on mobile devices and computers. The essence of podcasting is to create content for an audience **who wants it**, when they want it, where they want it and how they want. This differs dramatically from traditional broadcasting where content is broadcasted at a specific time on a specific device for an **intended audience** who may want it.

The easiest way to consider podcasting is like that of a magazine subscription with your local newsagent. You subscribe to a particular magazine of your choice through the newsagent, at that point of subscription the newsagent might offer you the chance to order back copies of the magazine. It is up to you which issues (if any) you decide to back order, more importantly you have made an agreement with the newsagent, for him to deliver every future addition of the magazine straight to your door fresh from the publisher.

The key players in this process are the publisher of the magazine, the newsagent who sells the magazine on behalf of the publisher, the delivery boy who will ultimately deliver the magazine and finally the subscriber who is going to enjoy the magazine. The elegance of this system is the subscriber enjoys seamlessly regular content without having to do anything, past subscribing to the magazine in the first instant. The same key players exist within the digital realm - the publisher, newsagent, delivery boy and subscriber.

4.1.7.1 Publisher

The publisher is the producer of the content, the individual or entity that slaves over information to transform it into a useful and entertaining piece of content for the end user. In the realm of podcasting this would be individual(s) that makes the podcast, who architects information with audio, video, text, pictures, links etc. It is not enough to simply ship information, it must have proper structure and be eloquently captured with the desired medium - in order to be truly enjoyable and useful. In most cases, the publisher will be a legion of individuals, working hard to produce high quality content for the end user. This is very true of my project, it was the collaboration between many professionals to produce useful digital content. The publisher then makes this content publicly available and alerts the newsagent to the location of the content (i.e. the web address).

4.1.7.2 Newsagent

The newsagent is the gatherer of content, this entity is like a vast store or directory of content that is on offer. Alternatively, the newsagent is also where a user would request content from (i.e. in a traditional newsagent - they might not have a particular magazine on offer but you can request it through the newsagent). The iTunes Music Store is the newsagent within our digital world, it holds a vast directory of podcasts that are popular among users. It also allows

for users to request specific podcasts from private vendors, that is if you know the location of the podcast, the iTunes Music Store will ‘order’ the content on your behalf.

4.1.7.3 Delivery Boy

The delivery boy is the one that makes the final step to delivery the content to the subscriber. The delivery boy takes all the hassle of the subscriber constantly requesting or looking for the latest content - the delivery boy ensures that the latest issue it delivered the minute the newsagent gets it. The delivery boy in the digital realm is a combination of really simple syndication (RSS 2.0) and iTunes. iTunes is the library of personal digital collection, while the iTunes Music Store is a purveyor of digital content. The user’s iTunes application is their digital doorstep and RSS collects the latest digital content and drop it on the user’s digital doorstep, iTunes.

4.1.7.4 Subscriber

The subscriber is the end user, the individual who is going to enjoy and use of this wonderful digital content. The subscriber of a magazine may enjoy it over some toast, on the bus, or on the train or maybe in the living room at different intervals - or maybe in all these locations. A subscriber in the digital world can achieve the same with a podcast. They can enjoy the content in their living room through the television, or Hi-Fi, or on the move with a iPod. The digital content can be synced across multiple digital devices in multiple locations, in sync with a subscriber’s listening habits. Unlike a magazine, you do not need to remember were you left off when your reading your magazine - iTunes + iPod remembers for you and starts from that point when you return the content.

The simplicity of podcasting is that everything is done for the subscriber, they are not bothered with anything or asked any questions or forced to view advertising. In the digital age podcasting is a powerful platform to distribute content - the customer is in control. The power and popularity of podcasting is now becoming evident, The Daily Telegraph now has a podcast editor - Guy Ruddle and Ricky Gervais is starring and charging for content exclusively distributed through podcasts [19]. iTunes introduced podcasts into the mainstream little under a year ago, in the first 48hrs of podcasts being offered in iTunes over 1,000,000 subscriptions were made[40].

Apple did not invent podcasting, many individuals were already podcasting before Apple officially embraced it and there were applications, such as iPodderX which acted as the newsagent and delivery boy before Apple sat up and took notice. August Trometer, developer of iPodderX said “*Podcasting is like cappuccino, Gourmet coffee was around for a long time, but it took Starbucks to put it on the map. Apple is like the Starbucks of Podcasting*” [40].

Alongside introducing podcasts into iTunes, Apple introduced their own flavour of podcasts, namely **enhanced podcasts**.

4.1.8 Enhanced Podcasts

An enhanced podcast is really a container for various content, similar to a movie on a DVD. DVDs can contain more than just the movie, such as audio commentary, web links, photos and menus. Enhanced podcasts makes use of **MPEG-4 Part 14** based on Apple's Quicktime container format. The idea is to stitch or embed content together to create a unified whole. This is a very powerful concept and allows for audio to be playing, which allows for images and web links to appear in line with the audio. The file can also be chaptered much like DVDs, so if a user wants to skip ahead to a more desirable section of the audio, they just select the chapter from a menu.

This allows publishers to create content which is more versatile to the user. If your podcast is explaining something complex you can better aid understanding by displaying a diagram or picture. If you are constructing an audio tour or fitness workout you can display the relevant location or the exercise you should be performing. If the podcast is a review of a product, you could display the product from various angles, if the podcast is a discussion about the consciousness of machines then you can offer weblinks to various papers which have been cited in the discussion.

This extends the functionality of podcasts even further, it allows a publisher to architect a beautifully sculptured collection of information that utilises more than just one form of digital content, it is possible to link all forms together and allow them to complement each other. Enhanced podcasts allow users to make use of certain aspects of content when they can, when walking during an audio tour users will not want to focus on images which appear on the iPod screen, when they need to be aware of those around them. The user may choose to view images accompanied with audio in the comfort of their home before commencing the tour so that they are familiar with the layout before they commence the tour. This scenario showcases how a user may utilise the same file in different ways to achieve different objectives.

The power of enhanced podcasts is perfectly displayed within education where the publisher is able to link relevant content together in order to create a richer learning experience. Those who learn better with pictures, can utilise pictures, those who want to jump to a specific topic can select the relevant chapter. This can create an excellent study resource for students, as particular aspects of audio is emphasised via chapters and additional content.

The danger with enhanced podcasts is the student may infer from particular emphasis on content or from chapter titles, that some topics are more important or relevant than others - in other words they may infer assumed exam topics from enhanced files. This can be very dangerous, since not every aspect of content can be emphasised, if it is, like text it will lose its impact and become difficult to follow.

Enhanced podcasts are also more complex to create, since they require several forms of content to be prepared and more importantly timing has to be prepared, so that the content is displayed at the right intervals. This all has to be prepared as an XML file and stitched to the relevant content using a command line tool called ChapterTool. This tool takes the relevant content and the XML file and produces an enhanced podcast, that can be interpreted by iPod + iTunes. This isn't quick work, the lecturer has to listen to the audio and collate additional content on top of the original lecture they gave. This can present considerable amount of additional time and effort (dependent on the lecturer) spent by the lecturer on one lecture.

This means enhanced podcasts are very tricky, specifically within learning to create but ideally provide better study aids. In the project, construction of enhanced podcasts was done without heavy involvement with the lecturer. I attended all the seminars of a particular course and attempted to piece together my own interpretation of each seminar and collected my own notes, pictures and relevant links and documents from the lecturer. I then constructed the enhanced podcasts as an impartial student and broadcasted them.

Originally, it was the hope of the project to make far grander use of enhanced podcasts. However, in producing a educational enhanced podcast, it requires a lot of input from the lecturer on top of the content they have already created (i.e. audio), applying this to 20 or 40 lectures can mean an additional 20 to 40 additional hours of work. However, after spending time constructing my own enhanced podcasts from the seminars I attended - the result was a highly personalised collection of enhanced podcasts that would be of great benefit to me in studying (if I had an exam in the course).

This model of constructing personalised enhanced podcasts would be of greater benefit to the student who is studying, out sourcing the creation of enhanced podcasts to a student relieves work load on lecturers and ensures that content is not being produced for those that do not want to utilise it. This comes back to the learner led ecosystem, if the learner does not utilise an aspect of podcasting, then it will disappear and those students who do utilise it, it will flourish.

Future development of this project should include a web based system which allows for users to select a lecture and then personalise it with chapters, additional content and notes. The system will then ideally take the personalised content and stitch it with the audio and podcast it to the user. This web based system will further enhance the student's learning experience and will stay within the framework of a learner led ecosystem.

4.2 Putting the jigsaw together

The various jigsaw pieces described now need to be assembled in order to solve the puzzle.

4.2.1 Capture

The content needs to be captured from the learning session (i.e. lectures, seminars and tutorials). There are various options in capturing content, however it is important to make the process agile and simple to use or lecturers are unlikely to embrace it. The process should not *infect* the learning experience but students still need to know what lecturers are being recorded. The process also has to maintain the learner led ecosystem. Therefore the content will be captured the same way it is enjoyed.

Using the iPod combined with a voice recording accessory and lapel mic, the lecturer can agilely capture content. The lapel mic has a long white wire connecting the mic with voice recording accessory. This is similar to the way the famous white earbuds connect to iPod. This means the students can easily see when a recording happens. The lecturer only has to hit the centre button on the Apple iPod to begin recording. This is our simple agile process and

this is how I captured all audio content within the project (all video content was captured using a Apple PowerBook + iSight web camera).

4.2.2 Create

The content will then be extracted from the iPod and edited using Audacity (open source audio application), to remove any unnecessary audio, enhance the overall quality of the audio and to add intro and outro music. The content is then converted into MP3 and AAC format from the original WAV file generated by iPod firmware. The AAC files are used exclusively with podcasts and MP3 files are available for download from the podlearning website for those unable to subscribe to podcasts.

The benefits of Audacity is it is an open source multi-platform application which allows for editing and converting of digital audio. The problem with Audacity is it does not integrate intuitively with the Apple iPod and it requires some prior knowledge. It is not simple enough to allow lecturers with little time or interest to work with quickly. There is an alternative application that does, Apple GarageBand. GarageBand, is very simple to use and makes making a podcast very simple. The problem with the application is it is not free and only works on the Apple platform. This isn't really a concern right now as I made the podcasts and I am familiar with Audacity. However, serious thought will be required in deploying software to teachers for use, in contrasting ease of use with some cost.

Once the audio has been cleaned up it is ready to be packaged up and delivered. As you will recall there are two different types of podcasts, normal podcasts and enhanced podcasts. The audio format used in both, is the same it does not have to be adapted in any way. Normal podcast only had the relevant meta-data added to the file. Enhanced podcasts were produced by converting personal notes into XML and stitching it to the audio file using ChapterTool.

4.2.3 Cascade

The final step of the process is to actually get the content to the user. There are two methods of doing this, one is through the podlearning website the other is through podcasts. The MP3 and AAC files were placed on the server. The MP3s were then referenced to on webpages which users can browse. The podcasts were produced by constructing RSS feeds for each one of the courses, each learning session was an item within the RSS feed. The AAC content for a particular item is referenced using the enclosure tag. The user can access this RSS feed through a podcast client such as iTunes, where the individual items will be interpreted as episodes.

The publisher also has the option of declaring that they do not wish to be listed in the iTunes Podcast Directory, thus forcing the user to request the podcast, which means the user must know the podcast web address.

The lecturers that took part in the project, were very concerned about those who had access to their content. This is understandable, however it is crucial to maintain a high quality experience for the user. After discussion with the lecturers the decision was taken to limit promotion of the content, therefore I prevented publication of the podcasts on the iTunes Podcast Directory and users had to enter the web address for the podcast they wanted.

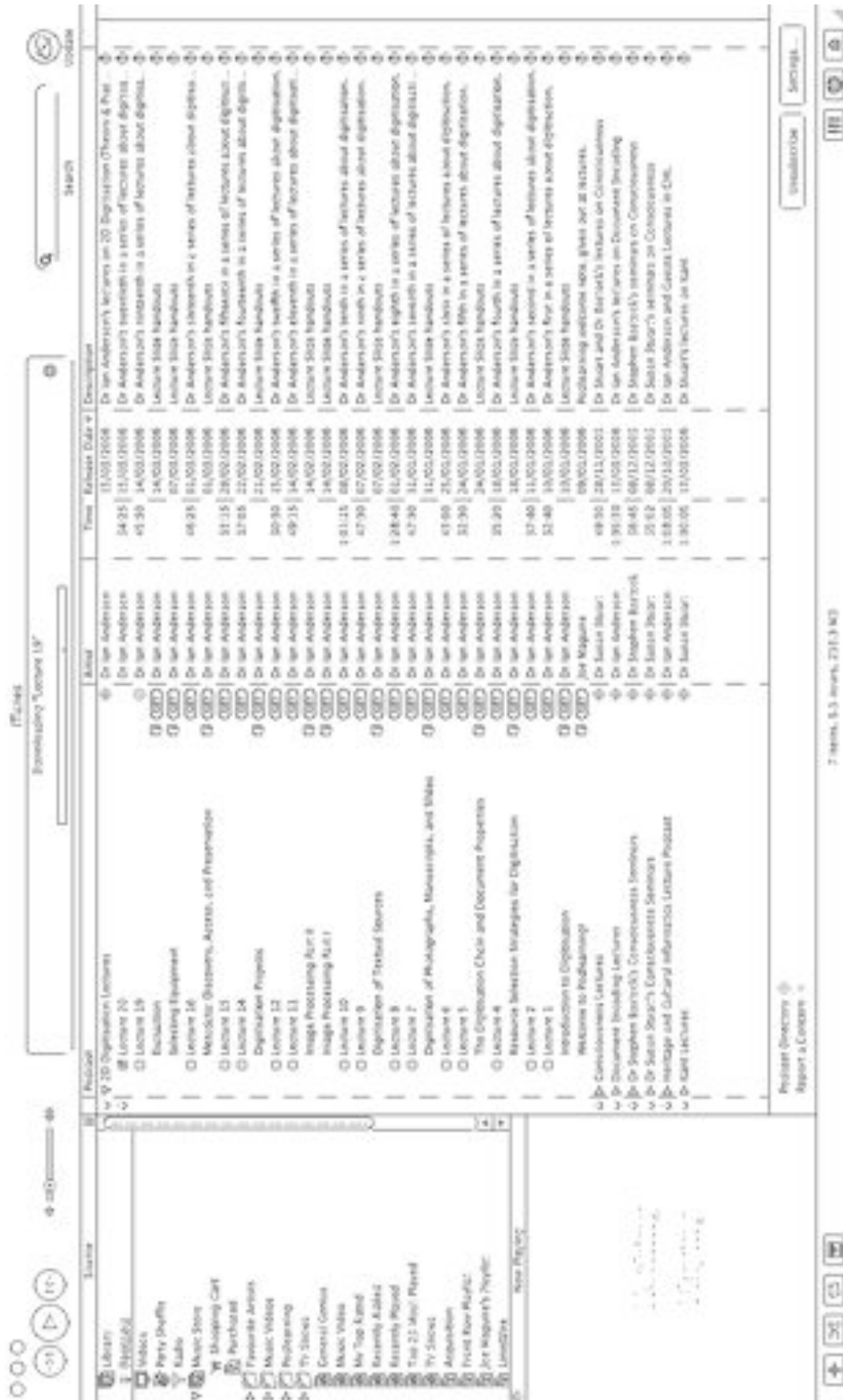


Figure 4.1: Using podcasts with Apple iTunes

Figure 4.1 shows several successfully subscribed to podcasts in iTunes. The interface is simple in its display of podcasts, in the main screen you can see how a podcast is described - from left to right, the podcast title, author of the content, the duration of the content, the release date of the content and a brief description (when the small icon next to the brief description is clicked a full text summary is displayed). You notice that there are seven podcasts currently subscribed, each with a title, next to the title of the podcast you can see a small triangle - when this triangle is clicked the podcast expands to display all the current episodes within that podcast. If an episode has a small blue dot next to it on the right, then it is a fresh episode which the user has not used yet. If the dot is orange then that particular episode is being downloaded. To the left of each podcast episode title are other icons, some dynamic some static. The static ones are content descriptor icons, there is no icon for audio. There are currently only two content descriptor icons in iTunes (version 6.0.4) that is documents and video. If the podcast episode is actually a document (i.e. PDF document) then a book icon appears to indicate such, if the podcast episode is a video then a small icon of a screen appears. The dynamic icons are those to download a podcast episode and cancel the download of a podcast episode. When a user first subscribes, by default iTunes only downloads the latest podcast episode and displays any previously broadcasted episodes for the user to download if they wish (this relates to the newsagent example of a customer being able to order back issues). If a user wants a previous episode then they hit the 'GET' icon. All new episodes after subscription will be automatically downloaded by iTunes, this is once again by default and users can change these settings to their own personal preference.

There is no icon indicating to the user if an episode is a regular podcast or enhanced podcast episode immediately. The features of an enhanced podcast do not become apparent until a user actually listens to the podcast, when a user starts listening to an enhanced podcast a small icon appears next to the content information bar, this is the chapter menu - you can see this in Figure 4.2.

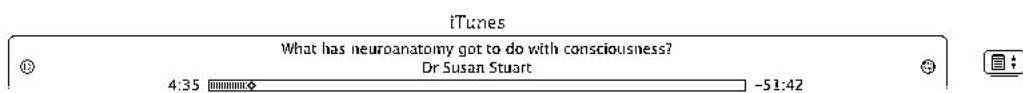


Figure 4.2: Playing an enhanced podcast in iTunes.

The chapter menu allows a user to select predefined chapters in the audio, this allows the user to jump to specific points in the content rather than having to scrub through it manually. Notice in the bottom left hand corner of the iTunes screen is the content pane. The content pane display additional predefined content at specific times, this can include images, web links and videos. In this particular example, the seminar group are discussing David Matthews, an image of him is displayed as well as a web link to a website with more in-depth information. You can see the use of the chapter menu and content pane in Figure 4.3.

The sublime integration of Apple iTunes + iPod allows for the benefits of enhanced podcasts to work on iPod. This means the predefined chapters and display of content is maintained on iPod, iPod does **not yet** have the ability

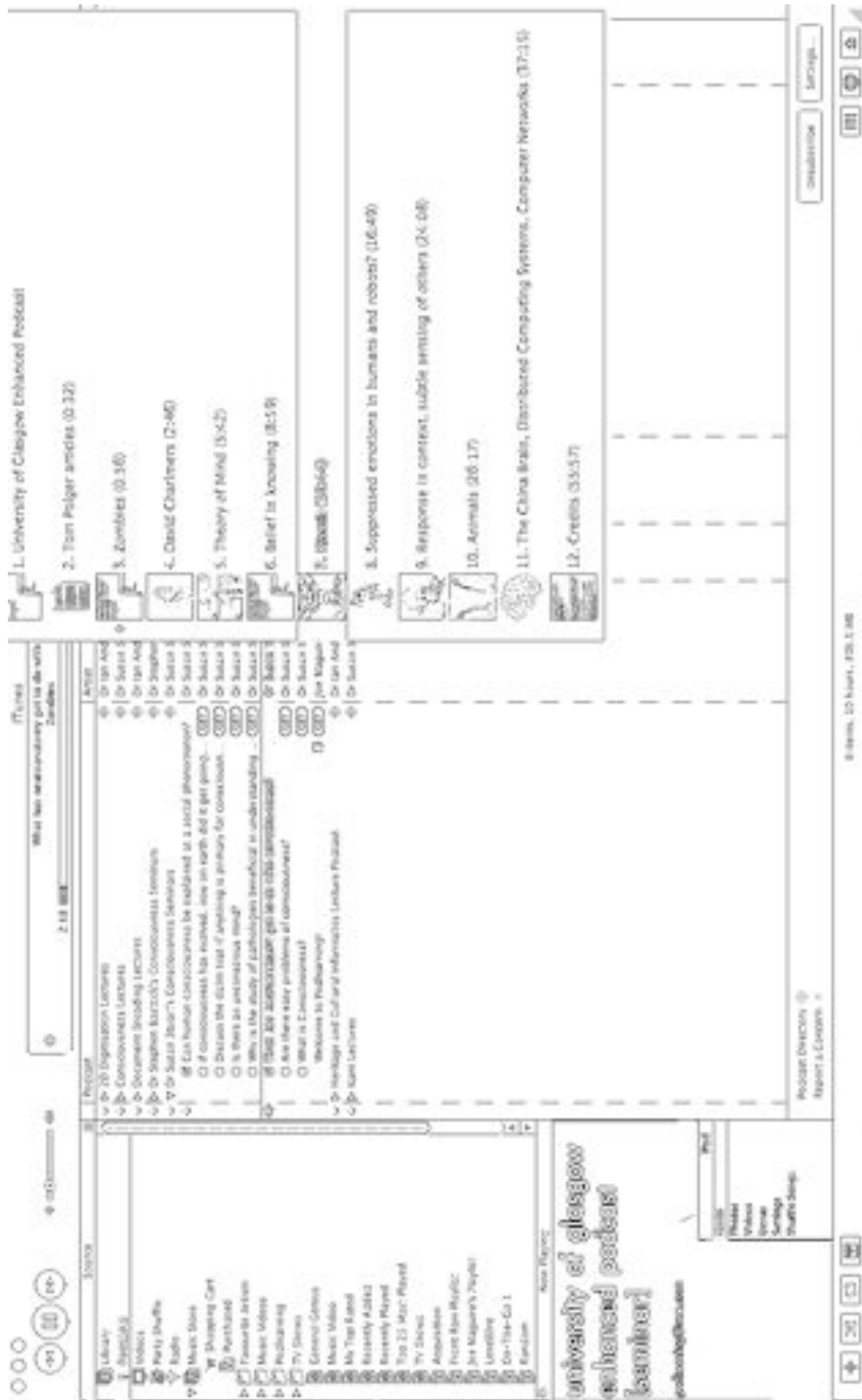


Figure 4.3: Selecting a chapter in an enhanced podcast.

to connect to the internet which means web links are not accessible to the user, they can however be displayed as text to the user, allowing them to enter the address into a web browser.

4.3 Recap

I have identified the various pieces used with podlearning and I have illustrated how they are pieced together in order to create a successful learning method. I will now summarise this in the form of an algorithm or rule set.

4.3.1 Podlearning method

1. Request iPod from willing student

- 1.1 If an iPod is forthcoming, attach recording accessory and begin recording.

- 1.2 If no iPod is forthcoming then carry on with learning session.

Note: Only request an iPod if no student has already offered. Do not state a recording is happening or that it is not going to happen - the lack of iPod in any case will indicate this to the user (without wasting any of the learning session).

2. At the end of the learning session, inform the student to upload the content to the university servers at the earliest convenience.

3. When content materialises on server, clean & convert content ideally only to AAC (currently MP3 format is also required).

4. Construct course feed, or edit existing feed with new episode. Referring to the new content.

5. Publish new/updated feed to server (also update webpages with link to MP3 variant).

6. Content will now refresh in podcast client when it is next opened by the user.

Currently, this is close to an ideal scenario. It would be nice if students were able to independently host various lectures on their own student web space and then the lecturer could reference these spaces in the course podcast, this would further reduce the amount of effort and time spent constructing the podcasts. However, this is not realistic at this point in time. It is also advisable that in the early years of this adoption, the lecturer should use their own iPod or a university funded one in order to 'sell' the idea to the students. A lecturer 'purely' demanding an iPod without indicating benefits could be confusing for a student and the system will die from lack of understanding rather than desire.

4.4 Puzzle solved

You can now see the image, without seeing the composing pieces. The users of podcasts and enhanced podcasts are unable to see the vast integration and effort of capturing, creating and cascading this content. They are unaware of it, all the user need do is enjoy the content anywhere at anytime. The end result using the podlearning method on 5 courses, is over 80 episodes with approximately 130 hours of content. The next step is to see what the students think.

"A book is a garden you can carry in your pocket."

Arabian proverb

5

Other Applications

This Arabian proverb sheds some light on the beauty of books and one of their key benefits over digitised texts. iPod is far from ideal for enjoying books but could be realistically used for a reference guides. The user only wants to dip into reference guides, briefly looking for a quick answer. An encyclopaedia is an excellent reference guide which I am confident many students dip into, the problem with an encyclopaedia is the sheer size of it prevents it from being carried with a student to use wherever, this is also true of some course guides, being so cumbersome that the burden of carrying them often outweighs their benefits. If we could create the same benefit of a reference guide but reduce its cumbersome size so the student could carry it in their pocket, this would remove this major drawback. iPod can offer us this functionality, allowing for the creation of pocket guides for any topic, which the student can dip into anytime, anywhere. I have attempted to harness some of this functionality by developing reference guides for students.

5.1 Course Guides

iPod has a note facility which allows users to make textual notes and store them on iPod for reference anytime they want. Users may choose to store entire books on their iPod using this facility or just a shopping list. The note facility also allows for the development of *'podsites'*, a podsite being a very stripped down, very basic website.

Podsites maintain the concept of a regular website by linking content together through hyperlinks, when a user clicks on a hyperlink they are redirected to the relevant page. iPod allows users to link together pages and audio

content. This means you can build a podsite on Monty Python trivia which can reference audio clips that the user can listen to within the podsite rather than navigating through the iPod interface in the traditional manner.

Podsites also allow users to harness the power of the iPod user interface. This means a user can enjoy podsites without having to learn any new techniques - since navigating a podsite is the same as navigating your digital content. There are many companies already exploiting this ability of iPod, offering dictionaries, thesauruses and travel guides (usually at a price)[27] .

In the project I developed course guides for three courses, two of these courses were active classes using podlearning (i.e. Dr Stuart's Consciousness and Kant courses) and one was for a course not involved with podlearning. The initial concept was to develop these course guides into podsites so that students always had a copy of the course guide with them on their iPod. A secondary desire was to make the podsite come to life by linking it to content from the learning sessions (downloaded via podcasts). The end result would be a full outline of a course with links to content for that course.

The podsites were completed and initial impressions from staff and students were positive. However, I decided that distribution and the installation of podsites was too complex and that in their current form they were unsuitable for use with staff and students.

Further development from Apple and tighter integration with iTunes will make podsites easier to distribute and install. In their current form they are not suitable for novice users.

5.2 University Library

The development of mobile content for the university library occurred through discussion with students and staff. Depending on the department, some students make use of the library more than others. There are many thoughts on this, one prominent being students are intimidated by the library and are unaware of the services it offers. The library is desperately trying to ensure all staff and students are aware of the services they offer. One of the library's tactics is to offer an audio tour, provided by a company called Acoustiguide. This solution costs a significant amount to implement and maintain and although the tour is developed by the library itself, they do not own the copyright of the tour, Acoustiguide do.

I approached the library with the idea of podcasting content to students. Heather Worlledge-Andrew became my liaison at the library, working together we managed to develop ideas and concepts on how the library could utilise podcasting.

I then began to develop two key ideas: an audio tour and a reference guide which could both be podcasted to students. In developing the audio tour I took the current one implemented by Acoustiguide and looked at a (difficult to get hold of) transcript of the tour (see Appendix F for transcript). The tour was terrible (see Appendix G for my notes), the main problem with the tour was that it was bloated with information regarding nearly everything to do with the library. The library hoped this tour would be a way to familiarise students with the library and to get them through

the door. However, a student taking this tour receives the embarrassment of walking about with a large grey 'wand' stuck to the side of their face, sticking out like a sore thumb. Not only is the student already intimidated about the library but now their novice status is highlighted to all other library users. The tour takes a disgusting amount of time to complete, considering the tour is to really only covering two floors. I will never get that hour back.

My solution to the problem was simple, develop an enhanced podcast of the audio tour which students can listen to on their iPod and ensure it's concise and compact enough taking only a few minutes to complete. The idea is to familiarise students with the library so that they are no longer intimidated. The nasty grey wand is replaced with simple white earbuds (you could be listening to David Bowie for all anyone knows) and the dreadful hour long march is replaced with a 2 minute swift walk (60 seconds a floor).

It gets better: the library owns the content, not some company and they do not need to rent / buy / maintain any grey wands - students use their iPods. The library can even purchase a few iPods to allow students without iPods to take the tour.

I also developed a reference guide - designed to help students use the library services. I produced an enhanced podcast which highlighted the more popular services at the library. The podcast can be downloaded and used anytime and viewed anywhere. This means if a student is having problems finding a book, they can simply listen to the instructions on the iPod without anyone knowing what they are doing.

The benefit of using enhanced podcasts over normal podcasts in both these cases is it allows students to enjoy the content somewhat in line with context. The student is unlikely to require images while conducting the tour, since they are physically in the library. However, students at home or from other countries can enjoy the same tour with images in the comfort of their home. This shows the versatility of enhanced podcasts.

The solution offered by podcasts, allows the library to actually own the content and could significantly reduce their outlay for the audio tour as they are not paying for the lease and maintenance of additional equipment.

I presented both these solutions to approximately twenty senior library staff, including the director of the library (see Appendix H for presentation). The staff had many questions and I took a discussion session in order to answer their queries after the main presentation and demonstration of the solutions. The library was impressed, so much so they are applying for financial support to develop my solutions as a realistic replacement for current offerings.

“When you do things right, people won’t be sure you’ve done anything at all.”

God

6

Evaluation

I love the animated science fiction comedy Futurama. I am reminded of one episode, where God utters the above words in an attempt to guide the creator of a new world. The creator of the world seeks God’s wisdom - he is having problems pleasing everybody and if he helps one person - he inevitably hinders another. This statement is poignant in its message, I agree with it wholeheartedly - it is difficult if not impossible to please everyone and if you manage to do it, do they even notice?

If you develop a learning solution which is so elegant and useful in its nature that no one ever notices its existence - does that mean it was successful? Discussion, after all is essential to many aspects of learning but we never abstract it away from learning as a *‘tool’*. It is unusual for a lecturer to declare, there will be slides and some coursework but no discussion.

I can only wish for podcasting in education to reach this level of invisibility. It is early days although I am confident that with passion and innovation - podcasting can be an instrumental tool to learning. The efforts already made, need to be assessed using the very people that are intended to use the final product: staff and students. The results of the evaluation will help guide future efforts (if any) and reveal the success or failure of this project. I hope, as do many creators - that I have *‘done things right’*.

The system was assessed by issuing two questionnaires (see Appendix A and Appendix C for both questionnaires) to participating students (the first questionnaire at the start of the course, second questionnaire issued at end of the course), interviewing participating staff, analysis of individuals accessing the content (using web logs, see Appendix

E for full web log analysis report) and some specific data collected from a level 3 psychology class.

6.1 Popularity of platform

The entire system is a delicate puzzle I constructed earlier from various pieces. Using the wrong pieces will result in a failed system. iPod is one of those pieces, it is required to facilitate the learner led ecosystem. It is crucial in capturing content in an agile manner, i.e. a teacher uses a willing student's iPod. The content is also specifically (not limited to) for iPod, lastly the sublime interface requires little effort to learn and will not impinge on learning.

If iPod is not the dominant player within the university, the learner led ecosystem will fail not because of the lack of interest but because of the lack of an iPod. Although iPod has a 78% market share[6] and is the player which define its category[51] - it is possible that it is not the market leader among students or within specific groups of students. Therefore, it is crucial that the most popular player among students is iPod. It is likely that there will be more students who do not own any portable player, this is not a major concern since they can still access the content using iTunes (a free application) or through a dedicated website (on/off campus).

The students from the five courses that participated in podlearning were asked what type of digital player they owned, if any. The results can be seen in Figure 6.1, 34% of students from the five classes own an iPod. This is the largest group, greater than the 31% who do not own any player. The remaining two groups of students, the 25% who own another type of player and the 9% who own a mobile phone capable of playing MP3s.

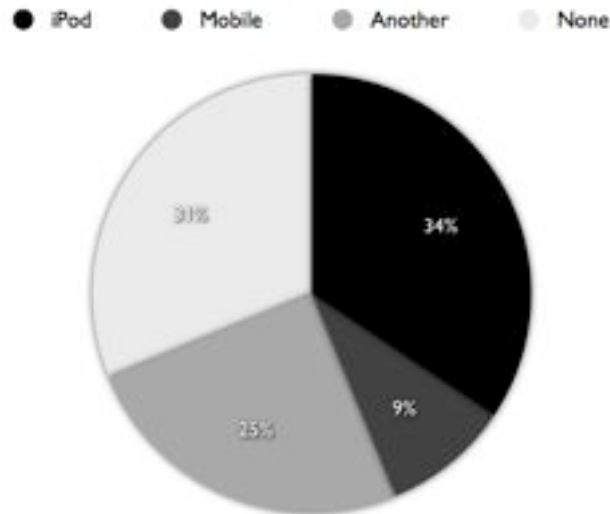


Figure 6.1: Owners of iPods within podlearning students.

This means that the smallest group are those without a digital player. The fact that the largest group of students

are iPod owners gives a clear indication of iPod's popularity and ensures that the choice of platform was a good one and that hopefully when a lecturer needs an iPod a willing student with an iPod will be within in the class. However, lets contrast these results from ones obtained by asking a level 3 psychology class the same question.

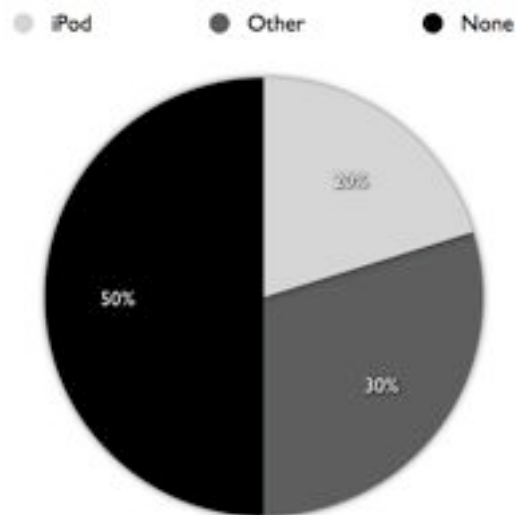


Figure 6.2: Owners of iPods within level 3 psychology class

The results are dramatically different and can be seen in Figure 6.2. Here we can see that 50% of the students do not own a player while 30% of students own another type of player. The smallest group of 20% are students who own iPods. This reveals that iPod might not be the most popular platform. The students who do not own a player are not of major concern since they download iTunes for free or listen to the content straight from the website. The 30% of students who own another type of player are a concern, or are they? This description of 'other players' is too vague. In designing a platform for mobile learning we know the capabilities of iPods, we know the the user interface, we know that any iPod can store several hours of content from a course and we also know which iPods can be combined with the recording accessory in order to capture content. However, of this 30% of players - which percentage belongs to Sony, Dell, Creative, SanDisk, Archos etc? This 30% isn't one particular player but a jungle of players, with various levels of storage, various capabilities and various interfaces. I have a mobile phone that can play MP3s, but it can't hold any of the content that is on offer through podlearning - because it has limited memory capacity. Tesco sells MP3 players for £20 which can't hold more than 20 songs never mind more than one lecture [22]. This means that out of the 30% of other players, it is possible that there are only a few capable of what iPod is capable of, while the rest might be a collection of Christmas cracker prizes and poorly implemented functions on other devices like phones and games consoles.

However, this 30% is still a large group of students and this is why I have ensured content is available in MP3

format. The 20% of students who actually own an iPod, indicates that this is the strongest player out of all the players and if a lecturer was to request an iPod, it is likely that a student would be able to offer one. Although in this particular class the iPod might not be the biggest group, it is the biggest group of one brand of player and this means that choice to use the iPod as the platform was a good choice.

The reason it is a good choice, is that the lecturer is more likely to get a willing iPod than any other player within a class. Staff only need to be trained on how to use one device combined with one accessory, the staff do not have to be trained on a jungle of devices. Mobile content can be designed to be optimised through a popular player and can also be used on free multi-platform application which is accessible to individuals who do not own the player, again fulfilled by iPod + iTunes. This suggests that choice of platform, was a good one.

6.2 Do they want the content?

The next item to establish is if a student will actually want this content, it is all well and good designing content for iPod + iTunes but there is little point in going to this effort in the first place, if the student has no intentions of using it. The students participating in the project were asked a range of questions regarding many aspects of the content. The students were asked if they would download digital content for their course before it was offered on their course, they were then asked the same question again after the course had finished. The results can be seen in Figure 6.3.

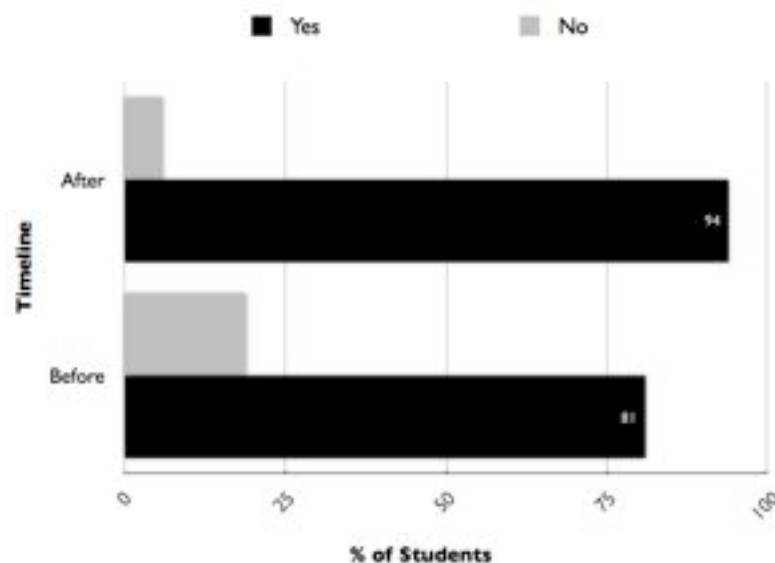


Figure 6.3: Percentage of students who would download digital content.

These results are interesting, over 80% of students would download content for their course before podcasting

even began on it. I was slightly worried that my efforts might dampen student's enthusiasm, luckily 94% of student after podcasting had been offered on their course said they would download digital content. These are excellent results, they emphasise that students want this content. The students were asked if podcasting would influence their choice of module and/or university (i.e. if podcasting was being utilised). It was initially hypothesised that there would be a very small minority that would answer yes to this question. The reasoning behind this was that podcasting has never run before in the university and the students had no idea of what to expect. The results were surprising, 32% of students said that podcasting would influence their choice of module, 34% of students said that podcasting would influence their choice of university. Although this is not the majority, it is very surprising considering that these results were obtained from students even before experiencing podcasting on their course. It would be interesting to see how this number may grow or shrink if the popularity of podcasting increases throughout the university. The students were also asked if there lecturer referenced other individuals's podcasts, would they download them. The results can be seen in Figure 6.4.

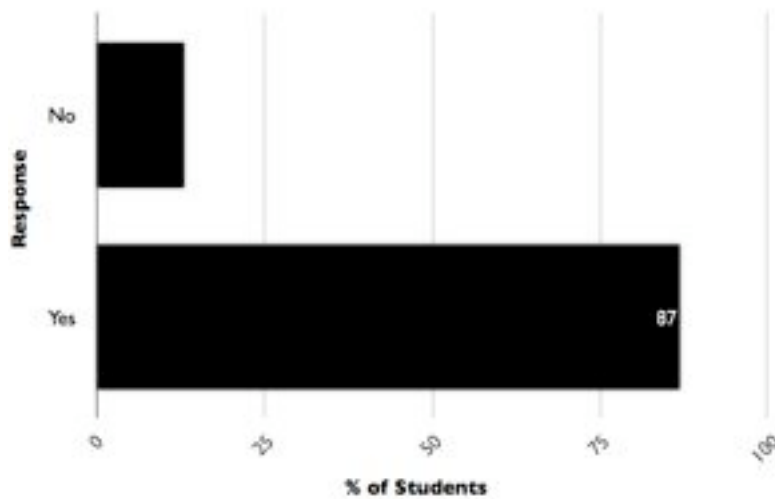


Figure 6.4: Students who would download referenced podcasts.

These results are very positive, 87% of students would download podcasts that their lecturer referenced. This result is in line with the earlier percentage of students who said they would download digital content for their own course.

All the results have been very positive and give a strong indication of the desire for the use of digital content by students on university courses. The next step is to assess what content students consider useful within a podcast and when they think it will be useful.

6.3 Using the content

There are various types of digital content that can be offered through podcasts and other types of content that can be utilised on iPod. The various types of content that can be offered through podcasts are audio, video and photos. These various forms of content can also be combined into enhanced podcasts. The content that can be utilised specifically on iPod is agenda and notes, agenda could be contact cards for lectures and calendars of events and classes for a particular course, the calendar files can store location of the learning session and the activities that will happen in that session. The notes can be full textual documents that store lectures notes and general course notes. The notes facility can also be utilised to create interactive course guides, that can be very helpful to students but are complex for individuals to install on iPod. The students were asked to rate how useful they felt the content was on a scale of 1 to 5 (5 being very useful, 1 not being not at all). The students were asked the same question again after podcasting had been offered on the course. The results can be seen in Figure 6.5.

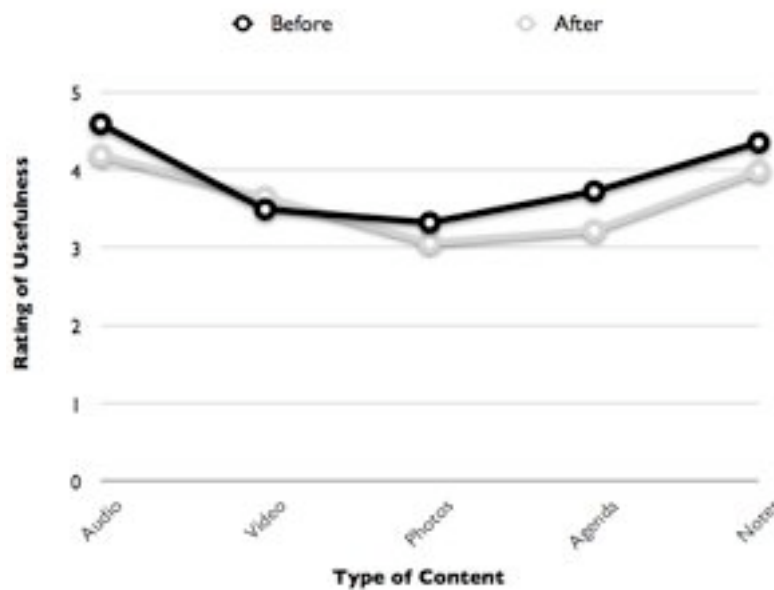


Figure 6.5: Rated usefulness of digital content.

The results indicate that in the first instance students feel audio is the most useful type of content as well as notes, these two forms of content receive a very high rating. The other three forms of content receive a close to neutral rating, although students still seem to view these three forms of content useful. However, after podcasting was offered on the course, all content receives a lower average rating except video, which receives a higher average rating. It could be that after experiencing some content, that students felt that it wasn't as useful as they once perceived. The change in rating is very small, audio and notes are still considered the most useful. None of the content was rated below

neutral, what we are actually seeing is the rating of content coming more in line, students are almost averaging out the usefulness of content. I think one explanation for this is enhanced podcasts and the idea of bundling. The students were experiencing various content in one unified form and they may now find that audio combined with photos are more useful together than separately, or the audio isn't as useful when it is not combined with other content. The fact that the rating for video has increased from the initial rating, suggests that students found the video being podcasted useful and increased their rating accordingly. The various content may be more useful when combined rather being separate. It is also important to see how useful students find podcasts when compared to other learning methods.

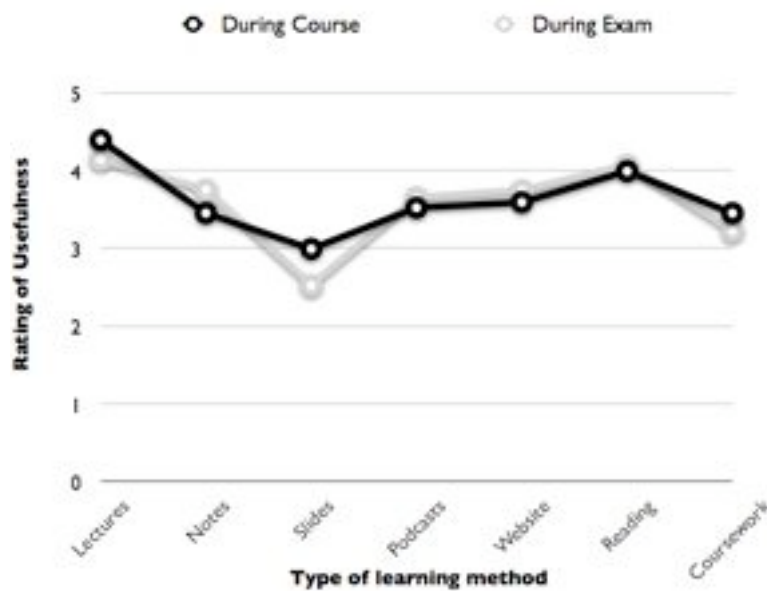


Figure 6.6: Rated usefulness of different learning methods.

The students were asked to rate learning methods based on the usefulness during the running of the course and in preparation for exams, using the same scale 1 to 5. It is important to iterate that podcasting has not been run at the university before and is a new medium, so podcasting being rated above content which has existed for several years if not decades would be a nice surprise. The results can be seen from Figure 6.6.

The results are surprising with podcasts being rated as the 4th most useful learning method during a course, behind lecturers, recommended reading and coursework. In preparation for an exam, podcasts are being rated as the 5th most useful learning method behind lecturers, recommended reading, website and notes. Although podcasts are not in the top three they have surpassed traditional methods such as notes and slides which are used heavily in some courses. There is not a vast difference in the rating between many of methods, except lectures outstrip every method in both cases. This means podcasts are being accepted as learning methods, they are performing well.

6.4 Did they use the content?

The students might have said they want digital content and would download it, but now it is time to analyse the web logs of the server to see if they actually did download it. It is important to highlight the fact that these statistics were taken before the spring break and main exam preparation period. If a company was selling a toy they would always wait for the performance of the toy during the Christmas period in order to determine the success of the toy. The company are unlikely to take statistics weeks before the main Christmas selling period. This is exactly what happened with the web logs, it is unavoidable since indications of performance were required for this report. This in part was balanced by asking students if they intend to access the content for the first time during the spring break and examination period. The results can be seen in Figure 6.7.

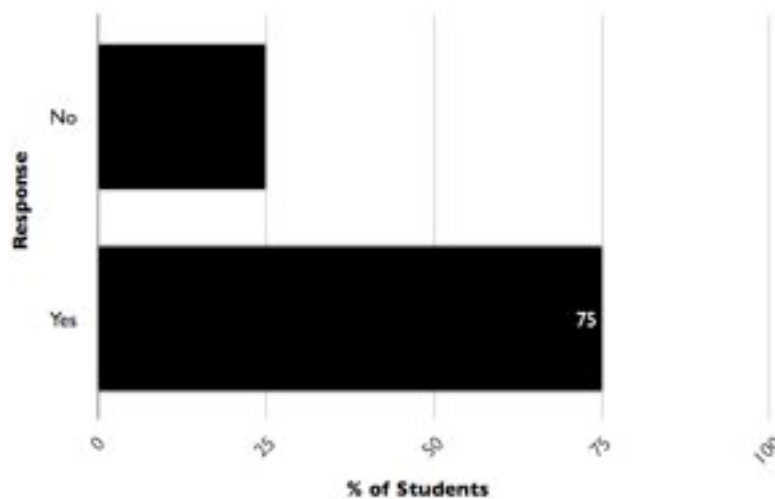


Figure 6.7: Utilise podcasts during spring break, examination period.

The results show that 75% of students intend on accessing the service for the first time during the spring break and exam period, so although we can infer what the most popular podcast was from the web logs this might not necessarily be true after the exam period has occurred. In order to achieve a real look of actual activity regarding the podlearning service at the university the web logs would need analysed again after the exam period. Analysis of web logs revealed the server received over 5000 hits with 324 unique visitors, 168 of these visitors accessed more than one page. On average visitors spent 277 seconds on the website, with the maximum time spent being 1780 seconds. The various types of files have been analysed in order to determine the most popular type. The results can be seen in Figure 6.8.

The most requested file types are the various RSS feeds, these feeds are the university's podcasts. This means podcasts are the most requested files we have on the podlearning server. These files can be accessed through RSS enabled browsers, iTunes and other podcast clients. The next most requested file type are web-pages on the server that

students would access in order to download the MP3 version of the content. Therefore from these statistics, podcasts are more popular than downloads from the server. However, MP3s are the third most popular file type and M4As are the fourth most popular file type, MP3s are used with the website while M4As are used with podcasts. These statistics suggest that those students subscribing to podcasts are downloading less files than those who are accessing the content through the website.

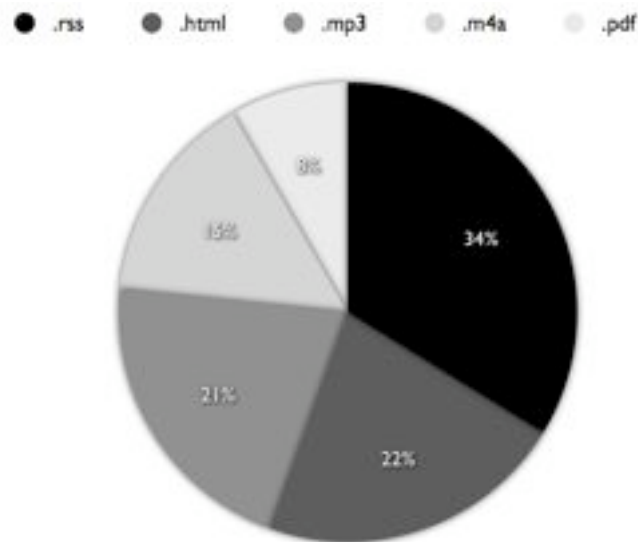


Figure 6.8: The most popular file types.

An explanation for this can be determined from the user's tactics, podcast clients will only download a file once and store it, then the user can listen to it as many times as they wish. This would only be recorded as one download. While students choosing to access MP3 content can listen to the file within their browser, or they can download and store it on their computer. The distinction is, if students listen to the content through their web browser and do the same again at another time - this will be recorded twice, rather than once. This would increase the number of MP3s being downloaded on record, but in actual fact the same file is just being listened to again by the same user. Of course, it is entirely possible that users have defected from podcasts to MP3s. Another possibility is that students could think that once they are subscribed to a podcast they will be able to download other episodes any time they want without fear of the content being non-accessible, whereas some students may feel that a website could disappear before they get a chance to own that content. It is also likely that a lot of people might be '*playing-around*' with the podcasts, subscribing to see how they work and what they have to offer rather than actually utilising them, remember a podcast holds several episodes. This means that an individual might subscribe and download only one episode, purely to see how the system works rather than them actually utilising the content.

The project was demonstrated to several external entities including the University Library, University Learning

Services and a conference in learning approaches at Strathclyde University. These talks happened weekly throughout the month of February, consequently the podlearning services received the most visitors within this period, with over 250 hits recorded in one day. The individuals present at these talks had no real use for the content, rather they wanted to see how the system worked. I believe this might account for such high rate of subscriptions to podcasts without download of content. Regardless it is important to remember that 75% of students indicate that they do not intend to access this content until the main exam preparation period.

Table 6.1: The most popular podcasts.

Place	Podcast	Activity	Subscriptions
1st	Dr Stuart's Consciousness Seminars	11%	195
2nd	Consciousness Lectures	10%	193
3rd	Kant Lectures	8%	189

We have looked at the most popular file types, now it's time to look at the most popular files. There are three podcasts in the ten most popular files. These three podcasts make up almost 30% of the website's overall activity, no other podcast appears in the top ten most requested files. The podcasts all belong to the same lecturer, Dr Susan Stuart who like Dr Ian Anderson has participated in the project during the whole year. This means that Dr Susan Stuart's students find her podcasts useful or she has been heavily promoting it to students in her class. There was only one enhanced podcast used on a course and that was Dr Susan Stuart's Consciousness Seminars podcast, which also happens to be the most popular podcast. This gives a clear indication of the value of enhanced podcasts have with students when they top the charts and become the most popular podcast. In effect Dr Susan Stuart received nearly 600 subscriptions to her podcasts, this is strange considering the podcasts were only advertised to collectively 60 people in her classes, how did Dr Stuart end up with almost 10 times more subscriptions than students? Have a look at Figure 6.9.

This is surprising, we took the steps to block the podcasts from being listed on the iTunes Podcast Directory, didn't advertise the website to anyone outside the academic circle (see Appendix I for promotional material), didn't link to the website and according to the web logs nobody accessed our servers through referral from another website. However, only 46% of the visitors were from within the United Kingdom. A huge 44% of visitors were from the United States and a remaining 11% were visitors from 9 other countries including the Republic of Korea, Japan and Bermuda. This means that 55%, over half of the visitors accessing the service were not even staff or students at the University of Glasgow. Visitors from around the world are unavoidable when content is publicly placed on the internet. I'm confident a number of these visitors will have been generated erroneously through people browsing the web and bots (i.e. search engine robots) from other web entities. These results do give a clear indication how even relatively large hits can be generated by users other than the students of a class.

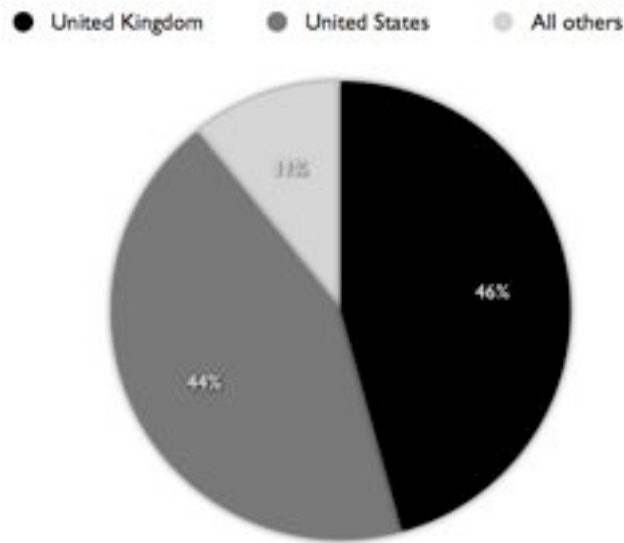


Figure 6.9: Percentage of visitors by country.

6.5 Staff Experiences

“Numbers have halved, and I think students think if they don’t make the lecture they can just listen to the podcast... one of my students said ‘I don’t feel the need to come in because I can always listen to it’.” **Dr Susan Stuart.**

Dr Stuart had the above to say regarding the use of podcasts on her Kant course. She noticed a distinct drop in attendance at her class, which she has never experienced before on this particular course. She stated that there were 18 students registered for the course, only 8 attended the last lecture. Dr Stuart also stated that one of her student told her they felt no need to attend because they could listen to the podcast. Although this suggests that podcasts have been a success with students on the Kant course, they seem to have effected attendance at lectures. This is undesirable since podcasting is meant to be a complement to traditional methods such as lecturing rather than a replacement. However, Dr Stuart is still very supportive of the use of podcasting on course, she had the following to say:

“I think it is marvellous...I am concerned about the class sizes but I think students are immature with podcasts and they will gain experience. I intend on using podcasts again next year.” **Dr Susan Stuart.**

It is clear Dr Stuart thinks podcasting has something to offer, she has used it throughout the year and has made future commitments to use it again. She has also offered some explanation as to why attendance dropped on her course and why this hasn’t put her off podcasting. Dr Stuart thinks that podcasting is simply a very new medium and

students are going through a settling in period, regardless if they have mature learning styles or not. That over time they will learn the benefits of this medium and disadvantages when compared to lecturing and how both have to be utilised in order to have an enhanced learning experience.

6.6 Student Experiences

“time to concentrate during lecture, rather than trying to continuously making transcripts” **Student 1**

Student 1, Student 2 and Student 3 all make similar comments, they feel podcasts are a better resource than frantically written notes. The students also state that it allows them to actually focus on the lecture, rather than simply trying to write a transcript of what happened they can enjoy the lecture and make key notes.

“better resource than hurriedly written notes” **Student 2**

These comments suggest that student’s learning tactics have actually changed with the introduction of podcasts, considering podcasts are a relatively new medium this is a powerful indication to the perceived benefit of podcasts by students. The students also give a strong indication that podcasts actually allow them to gain more from the original learning session by allowing them to capture information which they might have missed or mis-interpreted.

“gives you the chance to listen to the lectures again and pick up on points you may have missed” **Student 3**

This suggests that podcasts actually allow students to get the most out of a learning session, in the first instance they can enjoy the session focus on what is being said rather than being distracted with creating notes and they can use the podcasts to clarify or unearth new meaning from the original session. This feeling is also echoed in a comment made by Student 4 who felt that the introduction of podcasts represents yet another medium and gives students an increased chance of understanding.

“seeing the same thing in many different forms increases the likelihood of understanding it” **Student 4**

The final comment from Student 5 gives an indication that students think podcasts are a good idea, but they are only as good as the information they hold and if that information is incorrect then the podcast is purely perpetuating incorrect information. However is it possible that staff who are aware of their content being recorded are less likely to take the chance in giving out invalid information? Is it possible that with professionals in a given field able to comment on each other’s style will actually improve a staff’s ability? (similar in nature to Wikipedia). In this particular case Student 5 has either experienced a situation where they did not have faith in the lecturer’s ability or they felt they

were being fed incorrect information. Podcasts could be utilised to improve lecturer's performance by allowing other professionals to comment on them. However, this idea of individuals other than the students listening to a podcasts might be viewed as an undesirable aspect of podcasts by lecturers, which in turn might prevent the medium from finding a place within learning. This also highlights the aspect of privacy and how do we actually deal with students asking questions in sessions, this is even more crucial in an age of collaboration and context [42].

"I think it is a great idea providing that what the lecturer says in the first place is coherent" **Student 5**

"I dream my painting, and then I paint my dream."

Vincent van Gogh

7

Conclusion

Vincent van Gogh, compared his dreams to reality and his reality to his dreams. My dream was to develop a learner led medium that could shift through the dynamic environments of students. I believe within my project I have realised this dream, in that my efforts have been successful with staff and students.

7.1 What research did this project address?

I developed a mobile learning method using existing technologies that required a significant amount of consideration for the intended audience. The technology used was not selected because it was the latest or greatest but because it allowed for the elegant distribution of content to users without requiring significant investment of time or cost. The main focus was education and users, built around a strong focus on human computer interaction principles. I recruited staff and students on five courses to allow me to evaluate this method, in a real environment, both staff and student were more than willing and very supportive of the project. This constitutes a proof of concept, and furthermore tested the concept not just as demonstrator but on real courses. *In this sense, my project is distinctly different from most projects and research.*

This is because it is one of the first investigations into podcasting in education. I demonstrated something new in educational technology that was met with great interest from Professor Robert Matthew (Director of Learning and Teaching Division at the university), University Library Senior Staff and sparked much discussion at a workshop

in *'Flexible Delivery'* at the University of Strathclyde. This level of interest gives an indication of the importance attributed to this novel educational approach.

7.2 What did I establish?

I demonstrated that the podcasting concept in education can work, at least as measured by strongly positive participant attitudes. I focused on the users and developed a method that flourishes if they embrace it and dies otherwise. I demonstrated its use on five real courses. Unlike Microsoft Windows, what I developed people don't **need** but do **want**, it is all focused around them, truly learner led.

To establish whether there are objective educational benefits would require measures at or just after exam time, and a more professional evaluation which are beyond the scope of this project.

7.3 Finally

The project has demonstrated that there is a clear desire for digital content, distributed through podcasts or otherwise. It is debatable that the motivation from students might be the desire to stay in bed rather than attend a lecture but it is also arguable that students want to gain the most from their session with staff which podcasts allow. Podcasts allow students to actually listen to a lecturer and attempt to understand what is being said, rather than trying to create a transcription of what happened for later study. Attempting to create a transcript from a live lecture in comparison to podcasts seems like an inefficient learning method and this was echoed by many students in the evaluation.

This suggests that lecturers can make more of their meetings with students, which begs the question will podcasts compete with lectures as a way of learning? It is clear that in some cases, attendance dropped because the students felt they could gain a lot from podcasts, this means a lecturer could utilise their sessions with students in a different way. A lecturer may give a lecture through podcasts and use the time with students to hold a discussion. This means, podcasts offer the opportunity to improve learning practices and utilise modern technologies to create a modern way of learning.

However, it is clear that in many ways this reality is still much a dream. My project had passion + replication, I had a great passion in developing a truly mobile learning method that wasn't built on flamboyant technologies to impress peers but was built with realistic technologies that best aided students. The staff and my supervisor had great passion in attempting to enter into this medium and helped me significantly in achieving my goal. However, we did not do anything but replicate what already happens in a lecture - we haven't truly harnessed the power of podcasts because we didn't have a plateau to begin with, this project has created that plateau.

In the future, we don't want passion + replication. We want passion + innovation. In order to fully utilise the beauty and benefits of podcasting we have to delve further into learning methods and develop not only the technology of podcasting (which is in its infancy for learning purposes) but how we use it within learning and how we can shape

learning sessions to provide a greater benefit to students.

Podcasting combined with passion + innovation will allow modern learning to realise its dream. A truly learner led method which encompasses the many complexities of modern living and life in a simple, yet elegant way.

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