USING SMARTPHONES AND MOBILE WEB 2.0 TO CREATE A MOBILE COMPUTING PLATFORM FOR TERTIARY EDUCATION

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Today's smartphones are mobile multimedia computers – in Nokia's words, "It's what computers have become." Smartphone manufacturers have seen the potential of partnering with online social software (Web 2.0) sites (e.g., Flickr, YouTube, Vox, Ovi) to produce mobile computing platforms to capture and share our daily lives with friends and family, "anywhere, anytime." These tools can be utilised within tertiary education to create context-independent collaborative learning environments. Pedagogical design of learning experiences using mobile Web 2.0 allows a tutor to create rich learning environments for students beyond the classroom or lecture theatre.

This paper illustrates the potential of these technologies by analysing students' responses to a third-year product design project, which transformed a traditionally paper-based learning journal into an interactive, collaborative, online e-portfolio using mobile Web 2.0 technologies. Examples and scenarios are shown to illustrate how the implementation of mobile Web 2.0 technologies have impacted and transformed some of Unitec's Bachelor of Product Design courses. Students were provided with a Nokia N95 smartphone, a Bluetooth folding keyboard, and a 1GB 3G data account. They created an online eportfolio, and used the smartphones to capture and record learning events and ideas from a variety of contexts. The learning outcomes included the development of a far more media-rich and critically reflective collaborative experience than was previously possible using traditional approaches. Students were dynamically involved in new knowledge and co-creation, facilitating an explicit social learning environment.

BACKGROUND

This research project is concerned with appropriating the benefits of Web 2.0 anywhere, anytime, using mobile Web 2.0 (Web 2.0 services that are formatted for use with mobile devices) and wireless mobile devices (or WMDs). This appropriation of Web 2.0 tools within a social constructivist pedagogy facilitates what has been termed "pedagogy 2.0."[1] The emergence of these technologies has challenged many educators to attempt to understand the extent of their influence on student learning environments.

Definitions of mobile learning (mlearning) have focused initially upon the mobility of the devices and, more recently, the mobility of the learners. Sharples proposes a form

of Laurillard's conversational framework,[2] excluding the teacher, to define mobile learning by its contextual and informal learning characteristics: "The processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies."[3] Recent research into mlearning has highlighted the contextual "awareness" of mobile devices,[4] and the ability to "span" learning contexts.[5] However, what is unique about WMDs for mlearning is their ability to bridge contexts – i.e. to provide ubiquitous connectivity independent of the context of use, thus linking multiple contexts into the learning environment, continuing learning "conversations" via social presence and communication technologies. The WMD's wireless connectivity and data-gathering abilities (e.g., photo-bloging, video recording, voice recording, and text input) allow for bridging the on- and off-campus learning contexts – facilitating "real world learning." In particular, the context-bridging and media recording capabilities of today's smartphones make them ideal tools for mobile blogging. Smartphones allow a user to send text, photos, video and audio directly from the site of recording to the user's online blog.

Lave's situated learning model argues that learning as it normally occurs is a function of the activity, context and culture in which it occurs (i.e., it is "situated").[6] Social interaction is a critical component of situated learning, and learners become involved in a "community of practice." Collaboration and communication with peers and lecturers can be maintained in any context, using WMDs with a variety of communication technologies (email, online LMS, instant messaging, audio and video conferencing, SMS, MMS, mobile phone calls, etc).

Research Methodology

The basis of the research methodology used for this project is "participatory action research," and forms part of a wider research project investigating the potential of the mobile Web 2.0 as a phenomenon constructed by both lecturers and learners in the context of tertiary education. Yoland identified the key characteristics of participatory action research (PAR) as follows: *the researcher is a participant; the researcher is the main research instrument; PAR is cyclical in nature, involving action followed by reflection followed by informed action; and it is concerned with producing change.*

The wider aims of the research are to:

1. identify the key factors in integrating Wireless Mobile Devices (WMDs) within tertiary education courses
2. assess the challenges/advantages that these disruptive technologies present to established pedagogies
3. assess the capacity at which these WMDs can be utilised to support learner interactivity, collaboration, communication, reflection and interest, and thus provide pedagogically rich learning environments that engage and motivate the learner.

4. assess the extent to which WMDs can be used to harness the potential of current and emerging social constructivist e-learning tools.
5. support learning environments that embed multimedia literacy.

CASE STUDIES

This paper focuses on the effects of mobile Web 2.0 on the pedagogical development of the product design students and staff at Unitec, Auckland, New Zealand. The project was designed to show relevant constructs based on the experiences of the students and lecturers and their reflections as determined through actions.

The methodology involved uses a combination of structured surveys and semi-structured focus groups with both students and lecturers to enable them to reflect in detail on their experiences of using the technology.[7]

Third-year Design Project Paper

The overall aim of the final-year design project paper is to consolidate the application of design criteria to design process through facilitating an individual, final-year design project. The mobile Web 2.0 technologies were used to facilitate some of the assessment deliverables of the course. Students used blogs and e-portfolios to record pictures, videos and articles related to their project to and reflect on their design process. These were made available to the lecturers to provide direction, support, guidance and advice for design project management and address any relevant design issues. Students were assessed on this evidence to direct, organise, manage and document an entire final-year design project. Three major New Zealand companies participated in the final-year design project: Scion, a New Zealand Crown Research Institute providing expertise for biomaterials development; Design Mobel, designers, manufacturers and makers of beds; and Queensberry, designers and manufacturers of luxury wedding albums. The project evolved around the development of product design teams formed between the students and these external clients. The project design brief was to develop a commercially viable product for the assigned client. Student blogs and other Web 2.0 tools were used to record and reflect on their design processes, and were made available to the client for comment and interaction.

New Product Commercialisation (NPC) Project Paper

The NPC course assignment is a group project and requires multiple participations from group members and as well as from students in the class. Every week, each student is required to find an article that raises issues related to NPC in magazines such as *Design and Business, Idealogy, Bright and Unlimited*. The article may be directly relevant to the description of a particular NPC or it may simply raise issues that can be discussed in terms of NPC – e.g., the impact of imports, a clever marketing initiative, or tax changes for R&D. Using a blog as a means of communication, the student must write a synopsis of the article followed by their own interpretation of the points raised

(500 words per post). The synopsis and comments are published in a blog along with a link to the original article, either as a web-link or the magazine's details for the submission.

The major deliverable in this course was the creation and maintenance of a blog that provides a concise overview of successful product development and commercialisation processes. The blog must reflect the importance that design plays in this process. Collaboration and interaction between group members are important aspects of the project – each student works with their group to refine their understanding of their chosen article and any additional comments on it using the "comments" feature of each blog. This process is repeated weekly. It is expected that each member of the work group will be familiar with the selected article and be able to assist the author in reporting back.

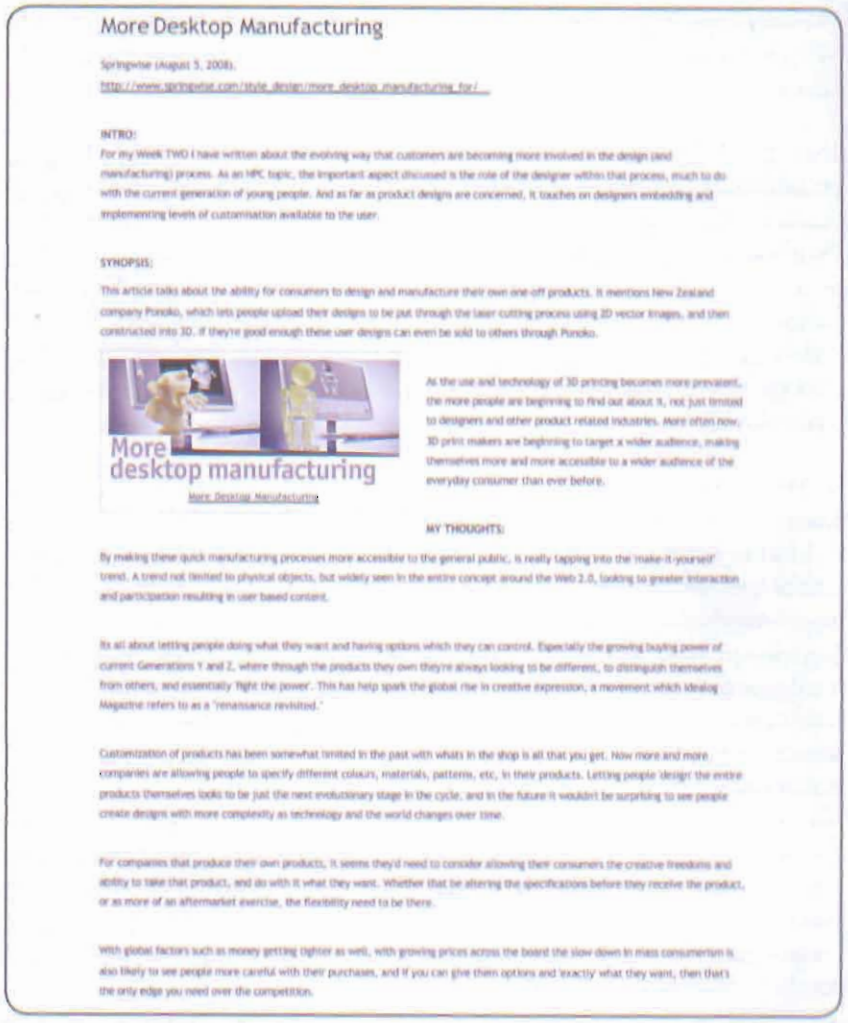
MODUS OPERANDI

Students and staff were each supplied with a Nokia N95 WiFi/3G smartphone and folding Bluetooth keyboard. Students used the smartphone for recording and uploading evidence of their design development process and models to their Vox blog (http://www.vox.com) and other online media sites such as YouTube for video. The smartphones are also used as a communication tool between students and with teaching staff for immediate feedback via instant messaging, email and RSS (Rich Site Summary, a format for delivering regularly changing web content) subscriptions. Students are responsible for paying for a voice call and text message account, but are reimbursed the cost of a 1GB/month 3G data account.

The project is supported weekly by a "community of practice"[8] which consists of the course lecturers, the student volunteers, and the researcher who is also the "technology steward"[9] for the community of practice. An interactive concept map illustrating the integration of the mobile Web 2.0 technologies with the smartphone is available at http://ltxserver.unitec.ac.nz/~thom/mo- bileweb2concept2.htm.

STUDENT LEARNING EXPERIENCES

An example of student blog posts for the NPC paper and comments from their classmates are set out below. The post (Figure 1) and comments (Figure 2) show significant engagement and critical reflection by multiple parties and within multiple contexts. The blog facilitated the posting of student reflections on examples of new product commercialisation and the extra dimension of peer critique of these ideas, with the ability to respond and enter into a collaborative "conversation." The use of WMDs (smartphone) facilitated searching for examples anywhere, anytime, and the ability to upload supporting media directly to the student's blog. Lecturers viewed and commented on student blog posts using their smartphones and Bluetooth keyboards, and subscribed to student blogs via RSS. However, students tended to read each other's



More Desktop Manufacturing

Springwise (August 5, 2008).
http://www.springwise.com/style_design/more_desktop_manufacturing_for/

INTRO:

For my Week TWO I have written about the evolving way that customers are becoming more involved in the design (and manufacturing) process. As an NPC topic, the important aspect discussed is the role of the designer within that process, much to do with the current generation of young people. And as far as product designs are concerned, it touches on designers embedding and implementing levels of customisation available to the user.

SYNOPSIS:

This article talks about the ability for consumers to design and manufacture their own one-off products. It mentions New Zealand company Ponoko, which lets people upload their designs to be put through the laser cutting process using 2D vector images, and then constructed into 3D. If they're good enough these user designs can even be sold to others through Ponoko.

More Desktop Manufacturing

As the use and technology of 3D printing becomes more prevalent, the more people are beginning to find out about it, not just limited to designers and other product related industries. More often now, 3D print makers are beginning to target a wider audience, making themselves more and more accessible to a wider audience of the everyday consumer than ever before.

MY THOUGHTS:

By making these quick manufacturing processes more accessible to the general public, is really tapping into the 'make-it-yourself' trend. A trend not limited to physical objects, but widely seen in the entire concept around the Web 2.0, looking to greater interaction and participation resulting in user based content.

Its all about letting people doing what they want and having options which they can control. Especially the growing buying power of current Generations Y and Z, where through the products they own they're always looking to be different, to distinguish themselves from others, and essentially 'fight the power'. This has help spark the global rise in creative expression, a movement which Idealog Magazine refers to as a "renaissance revisited."

Customization of products has been somewhat limited in the past with whats in the shop is all that you get. Now more and more companies are allowing people to specify different colours, materials, patterns, etc, in their products. Letting people 'design' the entire products themselves looks to be just the next evolutionary stage in the cycle, and in the future it wouldn't be surprising to see people create designs with more complexity as technology and the world changes over time.

For companies that produce their own products, it seems they'd need to consider allowing their consumers the creative freedoms and ability to take that product, and do with it what they want. Whether that be altering the specifications before they receive the product, or as more of an aftermarket exercise, the flexibility need to be there.

With global factors such as money getting tighter as well, with growing prices across the board the slow down in mass consumerism is also likely to see people more careful with their purchases, and if you can give them options and 'exactly' what they want, then that's the only edge you need over the competition.

Figure 1: Screenshot of student NPC blog posts.

blogs on their laptops. This is an example of a socially constructed use of the technology rather than an affordance of the technology itself.[10] Students were encouraged to subscribe to each other's blog via RSS feeds to enable automatic notification of new posts for discussion. Additionally, Vox features a weekly "neighbourhood update" email service that students could receive and read on their smartphones. This facilitated a social constructivist learning environment.

In another scenario, a student used the smartphone's camera to record still images and video podcasts outlining significant and iterative steps in the design process of a snow kite harness. This allowed the student to reflect and critique his design work and

design methodology using visual media, rather than simply creating a text-based book or online journal. This process took place over the six-month product design project. Video clips were recorded from the design studio on Unitec campus, from the testing locations, and from test flights during two ski-field trips in the South Island of New Zealand. The course lecturers were able to follow the student's blog posts anywhere, providing design advice and guidance. Footage of the most significant design steps taken over the course of the student's design project were later edited and compiled into a ten-minute video published on YouTube (the maximum video length allowed on YouTube) for showcasing and sharing with the wider community. This illustrates the affordances of mobile Web 2.0 tools to facilitate user content creation and sharing, in addition to context-independent (ubiquitous and seamless) input from lecturers.[11]

In another illustration of how students used the mobile Web 2.0 technologies to deliver their assignment from virtually any context, four of the students decided to go on a mid-term "research" trip to the snowfields of Queenstown to test their design prototypes. However, this coincided with a delivery of a scheduled presentation on the NPC assignment outlined above. In order to keep the presentations on schedule, the students used the smartphones provided to record their NPC presentations and uploaded them to their corresponding Vox blogs for the rest of the class and the tutor to view and comment on, in almost real-time. To "prove" they were in Queenstown they also blogged mobile videos of their campervan and Queenstown scenery!

During the course of the 2008 academic year, teaching staff were away on business or holidays overseas (in Japan, the UK, Spain and France) as well as several New Zealand centres outside Auckland (Rotorua, Tauranga, Napier and Hastings). While they were away, staff used mobile Web 2.0 technologies to stay in touch, create a virtual design studio and pass on relevant information to students from virtually anywhere.

During April 2008, a staff member visited Kyoto, Japan, to participate in a conference that took place during the teaching semester. The use of mobile Web 2.0 technologies allowed real-time text, video and still images of the conference, various sites, design features, and local architecture to be easily and immediately uploaded to the staff member's blog for students to see and share.

In a second case, another staff member was required to make a trip to the UK and France, taking valuable time away from teaching. At this stage, students were well advanced into their projects, and having a staff member overseas posed a potentially difficult situation for them and the programme. The use of mobile Web 2.0 technologies allowed the staff member, his colleagues and students to stay in regular contact, sharing comments and project concerns – in effect, a "virtual studio situation" was created. When the staff member returned, there was no need for time-consuming catching-up to take place and students were not significantly disadvantaged by his taking time away from studio teaching.

KEY CHALLENGES AND RECOMMENDATIONS

The integration of mobile Web 2.0 technologies into the Bachelor of Product Design has highlighted several key issues.

Unfortunately, the benefits of these technologies are not gained without difficulties. Using these technologies placed new and increased time, organisational, and pedagogical demands on the lecturers. Perhaps the most difficult of these challenges is the question of providing constant feedback to students using the technology. Once a project is created and mobile Web 2.0 technology is embedded in the context of a course, lecturers often finds themselves responsible for supporting the resulting postings. While this may not pose a significant problem the first or even the second time it occurs, it can be difficult to manage over the course of a year. This requires a change in time management and a refocus on regular formative feedback, rather than the traditional summative end-of-project feedback and assessment procedures. When this is implemented, the benefits for students and tutors in being continuously engaged in the projects is realised, creating a much lower reliance upon end-of-project presentations and summative assessment.

Another challenge associated with the introduction of mobile Web 2.0 is the number of courses within the programme adopting the technology. The major design project is focused on individual student work. In contrast, NPC course assignment is focused on a group project and requires multiple participations from all students. It is important, however, that lecturers continue to provide support appropriate to the type, scope, size, and pedagogical input of the technological aspects of the projects introduced into courses. The extra management load thus created for lecturers may lead to a reduction in the quality of the final product – potentially reducing the quality of the experience for the students.

A final challenge associated with using this technology is that it must be consistent within the programme. Many of these projects are initiated by lecturers keen to use the technology to enhance the students' learning experience. However, leaving it to individual lecturers to instigate such projects adds another layer of complexity and challenges for time management that may discourage others from using the technology. Creating a course-wide strategy for the integration of mobile Web 2.0 technology within the entire programme supporting these innovations is now a goal for 2010.

CONCLUSION

The use of the Web 2.0 technologies has demonstrated the potential to create an increase in student engagement with the learning environment. Higher levels of student reflection and critique were achieved compared to those previously seen with more traditional assessment procedures. "Anywhere, anytime learning" – learning that is context-independent and context-bridging – has been facilitated and used appropriately, even in unforeseen scenarios.

Figure 2: Screenshot of student NPC blog and comments.

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