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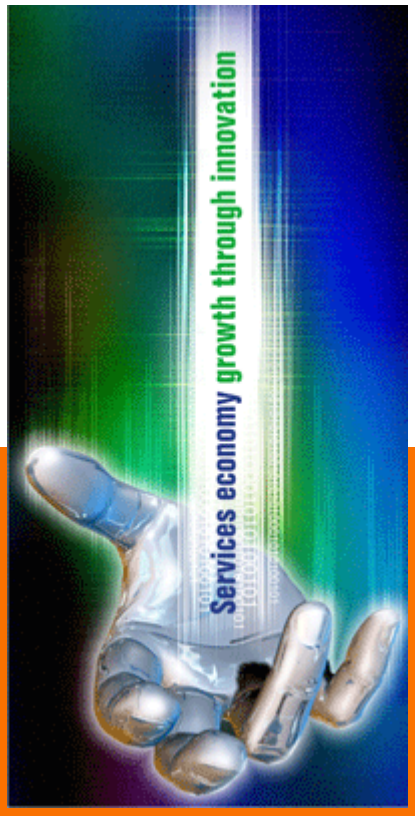

Immersive Services

Immersive Internet Australia: Education

December 2010

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Acknowledgment

Every endeavour has been made to fully acknowledge the work of external experts who were consulted and cited in this report; any errors in the report are my own.

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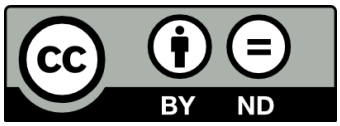

Federation of Virtual Worlds virtual conference centre, April 2010

Immersive Internet Australia: Education

A new modality for learning, collaboration and knowledge production.

By Mandy Salomon – December 2010

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Executive Summary

Immersive Internet Australia: Education documents the rise of online virtual environments, and how they can be utilised to promote active learning.

The idea that virtual environments are places for community engagement has been understood by the gaming community for some time, however the rise of the online world, *Second Life (SL)* during 2005-7, brought wider recognition, when a fascinated media reported on the more sensational aspects of living in a pixelated world.

Since then, the faint pulse has turned into a strong heartbeat. Globally, participation in online spatial environments is on the rise, spearheaded by a bullish kids and youth market, which sees constituents migrating comfortably to virtual worlds for social and gaming purposes. Equally, rapid improvements in the platforms themselves have prompted the serious consideration of 3D virtual environments for geographically dispersed or resource-limited communities, or where remote services and collaborative projects are being undertaken. These two factors, the wider uptake by younger generations, and the improvement in the technology itself, signal the increasing integration between the real and virtual world. It is timely therefore, to understand how multi-user virtual environments (MUVES) add value to the education sector.

Take-up is mostly at the 'trial' or 'exploratory' phase; this befits the development of the immersive Internet itself, as platforms are in their relative infancy, with issues relating to virtual worlds' security, scalability and interoperability still being resolved. However, developers are working to meet the challenges. The user- to- producer feedback cycle is accelerating the rate of improvement and a new wave of lightweight, browser based, more robust services is discerned. Furthermore, the shortcomings of virtual worlds have not stopped innovative educators from exploring their potential. The report identifies a local cohort of innovators, both at the user end, and on the services side who display ingenuity, variety and depth.

A significant feature of the immersive Internet is that it is an integration of well established online behaviours common to young people; these include participation in platforms that promote social connectedness, response to visual content, an enthusiasm for the sharing of media resources and ideas and a steep rise in the popularity of online games and kids worlds (often driven by trans-platform entertainment brands). These factors suggest that virtual worlds will become intuitive learning environments for digitally literate students.

Whilst it is early days and further evidence-based research is warranted, examples collected for this report demonstrate how immersive Internet technologies are being used to engage students not just in learning, but also in knowledge production.

In relation to the building of the National Broadband Network (NBN), many Australians are asking what the business case for a super-fast broadband service might be. Virtual environments ought to be considered in these discussions for they are generally bandwidth hungry; even lightweight platforms are impacted if user-groups are simultaneously looking at multiple embedded rich media, such as streaming video, streaming audio and presentations.

Introduction

Teachers and students from three countries: MLC (Aust), Christ College (NZ) and Kyoto Gakuen (Japan), meet out of school hours to exchange their experiences in virtual worlds for learning. <http://skoolaborate.com>

Consider the practice by multi-millions of people who digitally capture their lives, be it with photographs, videos or daily updates via Twitter; is it not such a big leap to imagine digitising life itself? Since the open, user-generated world *Second Life* went public in 2003, some 18 million adult users (Wikipedia, 2010) have ticked the Terms of Service box, and jumped in, even if only to sate their curiosity. But that is the proverbial tip of the iceberg. By 2010, hundreds of millions of people of all ages and nationalities had registered with an immersive environment platform of one kind or another[1], created an avatar for themselves, and stepped into the Internet. According to figures released by virtual world analyst, the UK company KZERO, 468m, or 46% of the total market, were aged between10 and 15. In 2009, the company noted a 90% growth in virtual worlds amongst children aged 5-10 years, indicating that the numbers will continue to swell (KZERO 2009b).

Just how many people spend time in online worlds, including immersive games and social hangouts, is a matter of informed debate, as estimates of virtual worlds participants vary widely due to ill-defined terms and non-standard measurements. However, as 3D-environment tools and platforms mature and diversify, quantifying user take-up is becoming less relevant. The important question is not 'how much do we do it', but 'what do we do?'

The 'Immersive Internet' is the generic term used in this report to encompass the tools that enable the 'doing'. Readers may be familiar with other labels such as 'virtual immersive environments' (VIE), 'multi-user virtual environments' (MUVES), 'the 3D Web', 'virtual worlds', 'computer-based interactive simulated environments' 'persistent simulated environments' – and there are even more. But though definitions are not set in stone, and platform properties are variable and evolving, virtual

[1] Virtual worlds analyst KZERO reports that in the third quarter of 2010, the total number of virtual world registrations numbered 1.009bn. < http://www.kzero.co.uk/blog/?cat=101>

environments share a core element: they are digitally created spaces in which metaphors for real-world interaction take place.

Just as the transposition of traditional news into the online environment has led to a re-think about how media is designed, created and consumed, so the digital age has created a new learning praxis, where the emphasis is not on retention of facts – in the wired classroom of the 21st Century, facts are literally at a students fingertips – but on collaborative problem solving. The advocacy of Henry Jenkins (2006) James Paul Gee (2009), John Seely Brown (2009) and Stephen Heppell (2010) are amongst many voices of those who recognise that the value of knowledge is in its application, and that it is created and devised through collaborative processes.

> *"Digital technologies allow us to build worlds full of the sorts of content we have associated with books, but allow young people to enter these worlds and experience directly the connections between words and other symbols and the world. They can see how these connections can be used for problem-solving.*
>
> James Paul Gee, (2008,16).

In the New Media Consortium's *Horizon Report* (Johnson et al, 2009), an annual compendium of technology trends in education, five key factors are identified as 'likely to have a large impact on teaching, learning, research or creative expression'.

They are:

- Global connectedness, such as the ability share collaborative work spaces
- Learners becoming active participants
- Experience with and affinity for games as learning tools
- Visualisation tools which make information more meaningful and insights more intuitive
- Mobile devices as indispensable tools.

Immersive tools are part of this new paradigm; they are extensible environments for creating, sharing, and building knowledge. This is the setting in which the elements of multi-user virtual environments and their use cases are discussed.

In respect to the delivery of education services, it is not always feasible to have face-to-face learning experiences, especially in remote locations or where resources are scarce. Under such circumstances, virtual environments can be configured as shared environments for students and teachers, who, represented as avatars, communicate via text chat or voice, upload and manipulate documents and watch streaming media, all in real time. It's a scenario that, for all intents and purposes, simulates a classroom experience; the next best thing to face-to-face. Or is it?

If the immersive Internet were merely a substitute for a physical classroom, then there would be no need to use it when students were co-located. However multi-user virtual environments are being used in situations where students are both in the same room as well as connected to each other in a virtual world. This so-called 'mixed reality learning' (Gardner et al, 2008, 8) involves teaching sessions structured around the *integration* of virtual worlds and established learning modules.

So what is it that multi-user virtual environments can do that students sitting next to one another can't? Let's start with a three-day workshop held at Melbourne Grammar School in July 2008.

The 'Make Poverty History' project, Melbourne Grammar School

Project Outline

Make Poverty History: a workshop at Melbourne Grammar School to build, perform and stream (audio and video) a real word concert into *Skoolaborate*, a region in the Teen Grid Second Life.

The Melbourne Grammar project was ambitious in terms of its limited (three-day) time frame. Led by Director of eLearning, Alberto Rizzo, students decided to build on the theme 'Make Poverty History' by creating objects and posters in an exhibition space in Skoolaborate to draw attention to the poor living conditions for communities in developing countries. The awareness campaign culminated in a 'mixed reality' concert with local bands. The actual concert, held in the school hall, was broadcasted into the virtual world, whilst the inworld version, comprising a virtual stage, and avatar representations of the band members and instruments, was streamed into the school hall on a large screen. Students from around the world logged in to the *Skoolaborate* region on to attend the event. Those for whom conflicting time zones were a problem were able to visit the exhibits after the event, and watch the real-world concert as archived media (Rizzo, 2008)

Students from Debney Park Secondary College mentor Melbourne Grammar students In 'The Make Poverty History In *Second Life*' project. July, 2008.

Practical issues

The *Second Life* component amounted to around $6,000, a cost which the School reasoned would be an investment in terms of future projects such as digital storytelling and machinima production [2] (Rizzo, 2008). The funds were allocated to technical personnel, including para-teachers with *Second Life* expertise, and extra equipment and bandwidth, (though the school's existing bandwidth proved to be sufficient).

Result

Alberto Rizzo believes the cost was justified, given the steep learning curve for the School and the need for experienced hands on the day. Following the event, a school *Second Life* group was formed involving MGS staff and students, and weekly workshops. The group continues to collaborate locally with Debney Park SC and further afield with *Skoolaborate's* global cohort. Activities include 3D modelling, content creation and storytelling. Some MGS students are proving to be so competent that they are employed as content builders in the wider education and training sector, earning $30 per hour (Linegar, 2010).

A mixed reality event at Melbourne Grammar School.
The live concert featured a background screen of the student-built second life version live on the web.
<http://workshop26.wordpress.com/2008/08/05/vide0-from-day-three-of-the-workshop>

In deconstructing the event, we can see that group work has occurred simultaneously in the real and virtual environment. Learning how to navigate and build content in the virtual world was a hands-on experience. No textbook was used. Students were able to create visual metaphors with inworld tools for their ideas about poverty in developing countries and no physical resources were required to do

[2] Machinima is the term used to describe constructed narratives within the virtual world. Machinima is a recognised addition to the collective body of digitally made stories, which includes video and film.

this. They were working in teams, and designated one another roles. A para-teacher with Second Life skills oversaw the event, as no teacher within the school had sufficient training to handle the event. However students were in a position to demonstrate their new-found skills to their teacher – a reversal of the usual paradigm where the teacher provides information for students to consume. The students had a critical time frame in which to achieve their goal, and were working with people from other schools whom they had not met before. Thus the project leveraged the mission, motivation and achievement characteristics that are so engaging in multi-player video games.

A common feature of these kinds of projects is the insider champion, one who undertakes to lobby senior management and CTOs. In the current climate, without such a person or team, a virtual world strategy within a given organisation is unlikely to succeed. A notable advocate and practitioner in the secondary school sector is Steve Collis, from the Northern Beaches Christian School (NBCS) in outer Sydney.

His school has made a major commitment to 3D learning environments and NBCS students are practised in their use of 3D interactive tools. They have created clothing designs and started a business for selling them using an inworld currency. There is bookstore for student writing, a welcome centre, an auditorium, an art gallery showing monthly exhibitions of student work, and an inworld radio station streaming student-made programs.

Governance, in NBCS' virtual environment is handled by its 'land council' there is a content regulatory body for programmers. Directed learning might take place at the Maths Maze, whilst group work has students beaming up into pods that hover above the terrain. Text chat is part of the assessment and is emailed directly to the teacher. A dance club enables students to socialise with their French counterparts, developing language skills and cultural insights at the same time.

Collis, who has a language teaching background, has overseen NBCS' many inworld projects, and believes that the students are learning 'high order skills' that 'would impress any employer' (Collis 2009b). He acknowledges the role played by his head-of-school, and that this is a crucial element when embarking on such projects.

Screen Shots from 'Booralie Island', Northern Beaches Christian College's Virtual World Project. Left: Cartoon Created in French Class, Right: The School's virtual world art gallery, where jpg images of student works are viewed in a gallery setting. <http://www.happysteve.com/3d-virtual-environments/>

In Western Sydney, Methodist Ladies College's Director of Online Learning, Westley Field developed *Skoolaborate*, a multi-purpose region in *Second Life's Teen Grid*. Regrettably, *the* teen

regions were dismantled as part of Linden Labs' August 2010 restructure. Many notable cultural exchanges and shared curricula took place there, attracting schools from Japan, the U.S., China, Chile, Taiwan and Portugal, as well as others in Australia. Field is working with Linden Lab to 'explore the next option' (Field, 2010), though an announcement as to where and how *Skoolaborate*, might transition is not known at the time of writing. As content from *Second Life* can be imported into *OpenSim platform*, and as many education- based projects are creating their own bespoke worlds with it , a move to *OpenSim* move seems likely.

The school also opened up the site to its parent community, inviting them to view a digital prototype of the new school-learning centre. This informed the final design.

MLC's new building and the virtual prototype; constructed in *Skoolaborate*

(Left) 'Africa Global Responsibility', a multi-school event.
(Right) Taiwanese students devised a presentation to introduce their culture to Australian students.

A snapshot of the Australian scene

The earliest forays into 3D learning environments in Australian Schools involved *Quest Atlantis* (2002), a world built on the *Active Worlds* platform, emanating from Indiana University, targeting 9 to15 year olds[3], and *Kahootz* (2006), devised under the auspices of the Australian Television Foundation, and which the Victorian State Government subsequently purchased for every state primary school[4]. *Kahootz* consists of proprietary content, based around flash-based games and movie making, whilst *Quest Atlantis* combines "elements of play, role playing, adventure, and learning, allowing members to virtually travel to three-dimensional Lands where they select developmentally appropriate quests and talk with other 'Questers' and mentors" (Oz-Teachernet, 2008).

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Current developments in virtual environments for learning reflect a burgeoning interest in virtual communities amongst students, spurred by the popularity of social networks and peer-to-peer sharing of content. Recent notable pedagogical explorations are underway, and they are being undertaken with considerable vigour. Immersive Internet educator Lindy McKeown has established a wiki[7], which, in June 2010, numbered 45 in the higher education category alone. An environmental scan undertaken for this report (table 1) highlights over 30 Australian institutions working with virtual worlds.

Lindy McKeown was amongst the first to use *Second Life* as an education environment, establishing the 'island' (in fact this is a dedicated server), *Terra Incognito*, in 2007, as part of her doctoral research into action learning at Southern Queensland University. In the same year, the Australian Film and Television School opened 'Esperance Island', where students learn machinima, narrative construction, game storyboarding and scenario planning for their film productions.

Many more edu-projects are conducted in rented space from professionally managed virtual world facilities. One of these is *Jokaydia*, run by Wollongong educator Jo Kay (2009); its mission is to 'assist teachers and students to gain competency and confidence whilst having fun.' The region is a venue for conferences and events, and it hosts space to a range of tenants, including the University of Adelaide's History and Politics Department, Macquarie University's Learning and Teaching and

[3] <http://atlantis.crlt.indiana.edu/>

[4] <http://www.kahootz.com/kz/>

[5] <http://atlantis.crlt.indiana.edu/>

[6] <http://www.kahootz.com/kz/>

[7] <http://aussieunivw.wikispaces.com/

Environmental Design Faculties, Hobart Polytechnic, Sydney Institute of TAFE and Charles Sturt School of Information Studies. Kay is also working with *Reaction Grid*, via *OpenSim.*

The University of Western Australia (UWA) is one of the most recent institutions to join the higher education metaverse[8], having launched its virtual campus in a mixed reality event in October 2009. In 2010, it was one of five nominees for the Linden Award for 'Outstanding Use of the Site'. Virtual UWA is a facsimile, recreating real-world features such as its gardens and duck pond as gathering points for prospective students and alumni. Current students can attend classes and participate in a competition to design the University's Second Life cultural precinct. The University's supercomputing program, WASP uses the site to extend its Collaborative Visualisation research, and both the School of Business and the Graduate School of Education use the platform as a teaching tool (UWA, 2009).

TABLE 1. Some Australian institutions (education and government) using virtual worlds.

Adelaide University: Interdisciplinary project with global affiliates. 'Georgian London' a virtual 18th century London to test the pedagogical and practical value of virtual worlds as an innovative learning and teaching space for the Humanities in Higher Education.
Australia Council: 2008-9. Literature Board, Visual Arts Board, Artists-in-residencies, Allocated in excess of $50,000 artist projects including 'Babel Swarm' 'Virtual Macbeth' & 'Thursday's Fiction', (*SL*).
Australian Academic Research Network (AARnet): investigating networking capability for academic research. Contributing to the NBN test bed. Looking to trial an intranet virtual world for its distributed workforce, (*SL, iSEE, ExitReality*).
Australian Film and Television School (AFTRS): Early adopter, with entry into *SL* in 2007. Laboratory of Advances Media Production (LAMP) teaches machinima, immersive storytelling, create mixed-reality games across platforms including mobile devices. Innovative leadership from course convenor, Gary Hayes.
Australian Learning and Teaching Council (ALTC) supports several research projects including 'Web3DExchange', http://web3dexchange.org/joomla/, (*see entry University Sthn. Queensland*) and the 3DLV project lead by Dr Denis Wood, (*see entry UniSA*)
Australian National Portrait Gallery, Canberra: 'Doppelganger', a mixed reality event explores digital identity October 2009 – March 2010 (*SL*).
Canberra Institute of Technology (CIT): *Eduversal*: using *Project Wonderland*, *Croquet* and *Mycosm*)
Curtin University of Technology WA: The Faculty of Health Sciences, Curtin University, (Western Australia) is collaborating with King's College London for 'inter-professional education', on nursing and pharmacy via a virtual clinic (*SL*) (Robin Watts, School of Nursing and Midwifery) <http://flc.curtin.edu.au/casestudies/virtual_environment.cfm#virtualworld>
Deakin University: studying governance and regulatory frameworks for students in Virtual Worlds, (Dept Criminology); Art and performance space for students (Dept Arts and Education).
Debney Park Secondary College, Victoria: 'The Avatar Project'. Pilot project with Victoria University using virtual worlds to increase confidence and skill sets amongst disadvantaged students (*SL*/ *OpenSim*).

[8] The 'metaverse' refers to the collective of persistent online environments including virtual worlds and augmented data layers introduced into the real world. <http://metaverseroadmap.org/inputs4.html#glossary>

Flexible Learning Network: implementation of virtual worlds for e-learning programs in the areas of retail, virtual tourism, and working with a disability. Campuses incorporating immersive learning include Gippsland TAFE, TAFE SA and Tabor Adelaide; the Network provides funding for innovative programs and placement of virtual world project managers <http://bit.ly/blLq5U>

Griffith University: Island used to experiment with learning techniques and better understand the efficacy of learning spaces fur uses such as virtual tutorials.

LaTrobe University: Conducting study on how *Second Life* can be used as an instructional tool for pre-service teachers (Campbell & Jones, 2008).

Macquarie University: Learning and Teaching Centre.

Melbourne Grammar School: inter-school project culminating in mixed reality concert on the 'Make Poverty History' theme, 2008, (*SL*).

Methodist Ladies' College: hosts *Skoolaborate,* a facility designed for schools on the (*SL*)*Teen Grid*; has an international focus with around 50 schools, 10 of which are in Australia.

Monash University: Topics being researched by Monash academics include: Identity and self in virtual worlds; legal constructs for virtual worlds; cross-cultural communication eg. Monash's *'Chinese Island'(SL)*<http://www.virtualhanyu.com/>; governance; privacy; ethics; communities of practice; cognition and motivation in learning; learning theory; social organisation; and language immersion. Virtual worlds and online platforms being utilised include *Second Life, Croquet, Active Worlds, EVE-Online*, and 'hybrids' such as *SLoodle* (interfaces Moodle with *Second Life*).Monash Island hosts the Virtual Worlds Research Discussion Group organized by Greg Wadley (University of Melbourne), Deb McCormick (Monash University). *Pharmatopia,* is an island for pharmacy and nursing students with international participants.

Multimedia Victoria: Development of the 'Melbourne Laneways' project in *Second Life* ', 2008**.** Subsequently published 'Would your business benefit from a Second Life'2008Outline and Assessment of the project at <http://www.mmv.vic.gov.au/VirtualWorlds>**;**

Murdoch University: In March 2007, the Uni set up an island as a 'new learning tool'. <http://www.youtube.com/watch?v=hySW5QC4JLw>

NSW Department of Education and Training, Centre for Learning Innovation. Has created a number of interactive online games for learning, and is looking to transition these to immersive 3D environments. Trialling for immersive software, *iSee* for remote learning and networking (see page 62-3) < http://www.cli.nsw.edu.au/>

Northern Beaches Christian School 'Booralie Island' in *SL's Teen Grid*. Many examples of collaborative and creative learning. <http://www.happysteve.com/2009/04/practical-examples-of-3d-virtual-environments-for-learning-in-high-school.html>

Queensland University of Technology: YAWL: a business work-flow system (Dr. Ross Brown). (*OpenSim*/*SL*).Other projects in the area of physics, environmental design, aerospace design, games teaching, legal education and training.

Research into curriculum development using the *Quest Atlantis* (*QA*) virtual world (Bronwyn Stuckey and Dr Margaret Lloyd)

Queensland University: School of History, Philosophy, Religion and Classics, were last year awarded a $30,000 UQ Strategic Teaching and Learning Grant to construct a 'Studies in Religion' island in *Second Life*, (Drs Farley and Strelan).

RMIT: various departments including Games, Digital Arts (Adam Nash), Design (Greg More), Creative Media and The Built Environment. Students create fashion and architectural prototypes, explore retail ideas, create art projects and build new tools. Creative projects include 'Dark Luminance, a mixed-reality art show, constructing narratives within virtual worlds (Dr Lisa Dethridge).
<http://www.rmit.edu.au/browse/News%20and%20Events%2FNews%2FArts%2Fby%20date%2F;ID=s8x04sgi1wnzz;STATUS=A>

Swinburne University of Technology: Business Systems students explore branding and business concepts (Dr Suku Sinnappen, Lilydale Campus).
Department of Media and Communications students explore virtual worlds as part of coursework (Assoc Professor Darren Toft), (*SL*).

University of Melbourne: NICTA researchers have created *Badumna*, a P2p network for transmission of virtual worlds. Research cohort use *Second Life* Research List <*SL*rl@list.academ-x.com> to update and collaborate with global research community.

University of South Australia: developing virtual world assistive technologies for people with disabilities. Research projects include www.virtualblinddog.com (*SL)* and the design and development on an open source, accessible 3D virtual learning platform. Collaboration with University of Coventry and six universities within Australia (Dr Denise Wood, Assoc Professor Gerry Bloustein).

Department of Law: Associated legal issues in virtual worlds (Professor Melissa DeZwart).

University of Southern Queensland (USQ): Established action learning programs for new users; mixed-reality specialists; facility hire 'Terra Incognita' Island, (*SL)*, (Dr Lindy McKeown); conducted ALTC-funded study Web3DExchange on educational uses of virtual worlds, 2008-9, (Project Leader: Assoc Prof Peter Albion, <http://web3dexchange.org/joomla/>.

University of Sydney: teaches English Department, New Media Literacies via English Department (Dr Angela Thomas). One project, 'Virtual Macbeth' involved several institutions including RMIT, USyd, AFTRS and the Victoria College of the Arts.

University of Sydney: ARC Research Grant 2009: $350,000 over three years to understand how innovative multi-user virtual environments (MUVEs) can be designed and used in Australian schools to enhance the learning of important scientific knowledge and inquiry skills. In addition, this project will develop science inquiry-based curriculum modules employing MUVEs that run on computers being distributed as part of the national Federal government Digital Education Revolution.

University of Western Australia: October 2009 Opened virtual campus: remote access to classes. Contact point for future and past students. Design competition.

University of Wollongong: ICT Research Centre developing *iSee,* and multi-point to multi-point immersive tools. (Professor Farzad Safaei) Pedagogical research (Dr Christian Ritz).

Victoria University: The *Avatar Project* and *Connected Lives* use virtual worlds to assist disadvantaged young people with new skills and social connectedness.

Victorian State Government: Dept of Education (e-learning div): purchased *Kahootz* for all state schools; curated an exhibition of student work in *Kahootz* for the Shanghai World Expo, 2010.

Dept of Justice: Experimenting with moderated juvenile courts (*VastPark*).

Some Fundamentals

In technology terms, a virtual world is a platform, either installed in-situ or delivered as a service that provides environments in which people engage via digital representations of themselves, avatars. Interaction is enabled through keyboard commands and through multiple channels (voice, chat, visual clues such as avatar position and gesticulation) with users being able to manipulate objects, navigate environments, or be aware of other users in the space. Common content is shared both synchronously and asynchronously and may be experienced as rich media (video, audio, music). These factors help to create a sense of 'immersion' which traditional screen-based activities such as web browsing do not.

The spatial element of 3D worlds, apart from being visually instructive, provides strong cognitive cues for avatars; the arrangement of objects within the space can provoke conversation, just as happens in the physical world. This kind of small talk can often be a more effective relationship builder than the formal content of the event (Thinkbalm, 2009). Voice itself has spatial qualities, dimming at a distance and getting louder when collaborators are located closer together. This allows people to gauge to whom they can talk at any given time, enabling multiple conversations to occur simultaneously.

Another primary characteristic of virtual worlds is 'persistence': the idea that even when an event is over, authorised users can access the virtual space at any time. Participants in another time zone may start the day with the results of real-time collaboration that occurred while they were sleeping.

Many people question whether virtual worlds and virtual environments are as effective as other communication technology such as teleconferencing. Whilst some characteristics do overlap, namely a real time shared visual and audio experience, virtual worlds have many elements that indicate that one is not a substitute for the other:

Virtual World Attributes

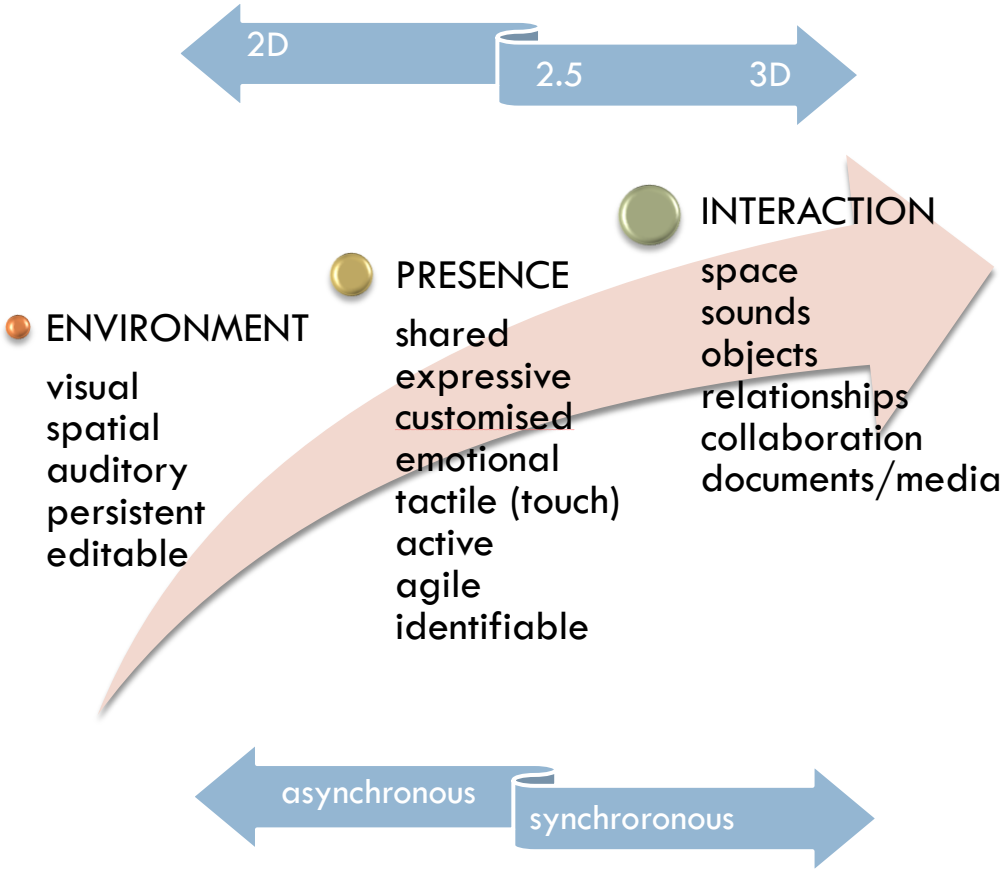
- Bespoke content, (making digital objects to order).
- Programmable objects (objects move or behave in particular ways).
- Persistent space (it remains intact when you log off, and reconfigures to that point when you come back to it, although modifications may be made by permitted users in the interim.)
- Multiple media channels, streamed live from the physical world, or archived.
- Physics, like shadows, wind, and other natural elements.
- Embodied presence (avatars).
- Interaction with other users in real-time via gesture, voice and text chat.
- Activities aligned with online game-play and social networking such as building communities, setting goals and acquiring digital goods.
- Ability to capture, store and replay action and events in the world.
- Collaboration and document tools such as 'drag and drop' and importing of web or desktop data.

- True multipoint to multipoint communication delivering natural crowd communication
- Detailed analytics and data mining both live and post the event (metrics).

Not all worlds have or need this complex mix; in fact one of the most popular worlds, *Club Penguin* which Disney bought for $(US) 350m in 2007, is built with Flash and is in 2D. There is less emphasis on high–end immersion, and a greater one on low barriers to entry such as a simple interface, lightweight (in terms of the amount of bandwidth it uses), multiple language settings, and parent-friendly tools for moderation (Merrifield, 2010).

However, the more immersive elements there are in a virtual world – and this generally means more bandwidth is required – the greater is its ability to mimic the physical world.

The U.S. technology consultancy, Thinkbalm (2009a), who worked with early adopter companies in 2008/9, created a framework of graduated experiences to gauge the level of online immersion. The company suggests immersion is 'a continuum that is determined by the degree to which the user's senses are engaged, and the desirability and meaningfulness of the activity in which the user is participating.' Factors which it lists as immersive are 'visual, tactile, auditory, and collaboration and interactivity', adding that a virtual environment 'doesn't need to score high in all of these areas to be immersive, but the more 'highs' it gets, the more immersive it is'. Industry consultant Richard Hackathorn suggests 'soft principles such as feelings' should be added (Thinkbalm, 2009a).

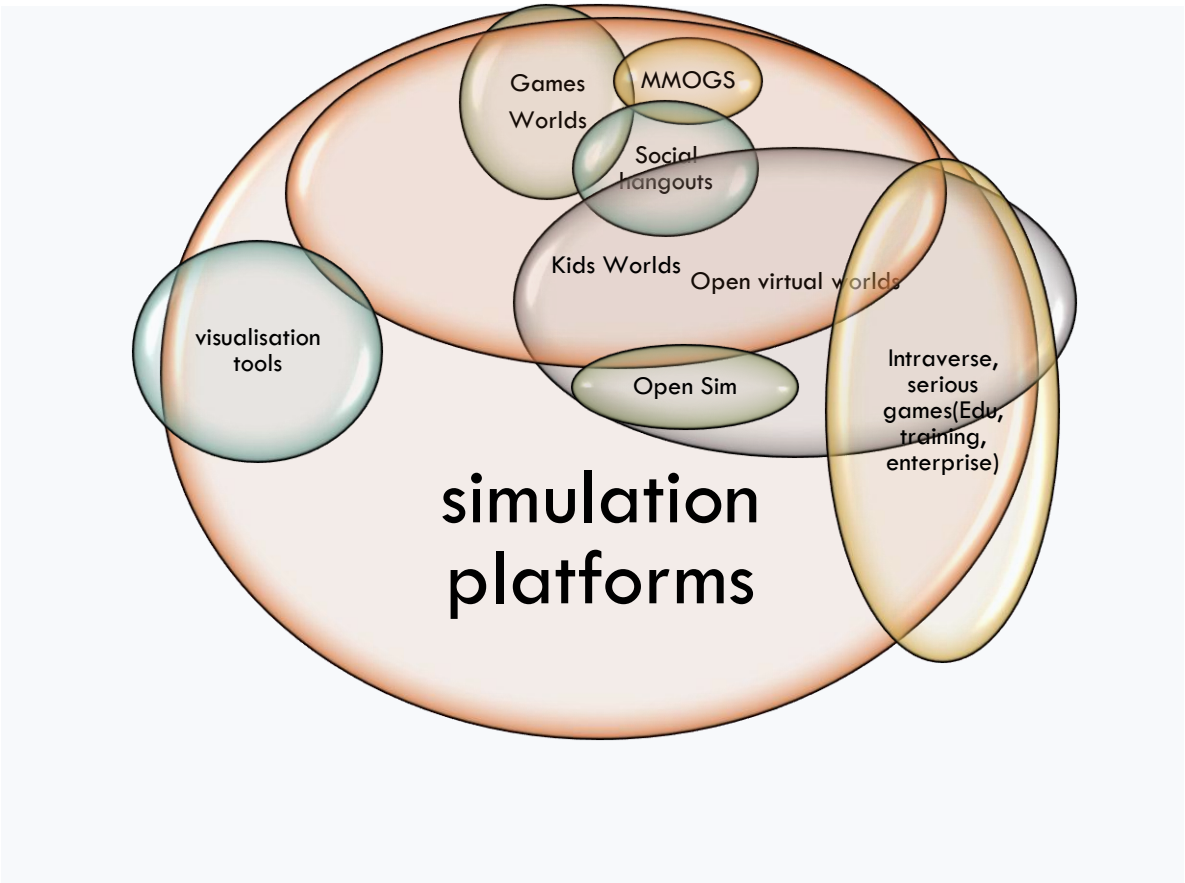


Immersive factors aggregate to create a rich environment for interaction and engagement. With immersive worlds, collaboration takes place in real time (synchronous), whereas with email, or even posting a tweet, cause and effect is impacted by a time lag (asynchronous).

The high fidelity environment of virtual worlds delivers a comprehensive set of markers (metrics) for monitoring behaviour and response. Data capture includes touch, movement, location, chat logging, avatar-to-avatar interaction, avatar-to-object interaction, and environmental factors such as the influence of a particular design on activities. Engagement can be measured around set parameters; this is useful in assessing response to a product or design. Distribution of promotional virtual goods can be tracked. Activities can be monitored by an analyst or moderator with an invisible presence, or archived as a video for later study.

TABLE 2 Virtual worlds 'use cases'

TYPE	EXAMPLE
Command and control	A facility management system in which real-time data from different facilities can be brought into a 3D-environment to visualize hot spots, data flow, and server utilisation.
Service delivery	In the health sector, diagnostics and patient support, such as using virtual environments to improve cognitive function after brain injury, or providing a clinical or therapeutic environment for people isolated through illness or disability.
Prototyping and design	Show case next-generation operations centres, such as oil rigs (*Teleplace*) Palomar West Hospital (Cisco/*Second Life*). Mock-ups of objects, living spaces or urban design. Users traverse, interact, or customise in order to get a sense of space and function. Companies launch virtual products to gauge market response.
Social, entertainment and retail	Recreational spaces for meeting. A place for self-expression (content creation, machinima). A place where identity can be explored (avatars). Includes Kids, Tweens and Teens (KTT) worlds, branded worlds (*Barbie Girl, Neopets* etc), and virtual platform TV and film properties (MTV's Laguna Beach, Disney's Pirates of the Caribbean) Streaming of live events from concerts to political broadcasts, purchase and trading of virtual goods with click through to the Web for real-world purchases.
Education and training	Establishing workflow practices and scenario building such as emergency response. Remote learning. Learning through 'doing' and 'experiencing' via spatial and visual metaphors, game play, cultural exchange, group work.
Enterprise	Meetings and forums, project and document collaboration, customer/client role-play, trade shows, brand extension, recruitment, product placement, virtual goods.
Metrics	Market research, academic research, data aggregation, maps.



The universe of the immersive Internet: simulation platforms vary in their characteristics and are built according to market sector needs. (Below) some well established titles, according to classification.

MMOGs **Eve Online, World of Warcraft, Lineage, Everquest, Lord of the Rings, Entropia Universe, Ultima II.** **KIDSWORLDS** **Stardoll, Saddle Club, HelloKitty, Lego Universe, Kung Fu Panda, WeeWorld, Build-a-Bear, Webkinz, Proptropica, Club Penguin,** Sony Play-Station's **Star Wars, Home, Barbie Girls, Toontown** **SOCIAL HANGOUTS** **IMVU, Gaia, Meez, Habbo**	**PUBLIC SOCIAL WORLDS** **Second Life, Multiverse, Blue Mars, Whyville,Kaneva, ProjectX, Mycosm (Closed Beta), Active Worlds,Twinity (Closed Beta), There (2004-2010), Playdom (formerly Metaplace 2008-2009).** **OPEN PLATFORMS.** **Open Wonderland, Sirikata, Open Cobalt, realXtend, Unity, Vast Park**, **OpenSim,** These are generating hundreds of private worlds including**, Reaction Grid and Science Sim (via Open Sim)**	**INTRAVERSE (behind-the-firewall) WORLDS** **Second Life Enterprise, web.alive Rocket, Offspring, OLIVE, Quest Atlantis (using the Active World platform), , 3DXplorer, US Nexus, Blue Marss** **Protosphere, Poweru, Unisfair, Inexpo,On24, Venuegen, Teleplace, ,** Lenovo's **eLounge, Vastpark** **VISUALISATION TOOLS** **ArchiPlace, SimUrban, ImagineLab, Thinkingworlds**

iSee

Smart Services CRC partner, the University of Wollongong is developing an immersive multimedia system which brings a new experience to group collaboration. Instead of users represented by graphically produced avatars, they can place their actual images in real time, via a webcam, into the environment. Participants see themselves as floating live images encased in a screen-shaped avatar (below) and can move around the environment's gardens, lecture theatre and meeting areas. Professor Farzad Safaei and his team at the University's ICT Research Institute have built the prototype on the *Unity* platform, and trials are underway.

Having looked at Avaya's *WebAlive* (formerly owned by Nortel) and *Open Wonderland*, NSW Department Education's Centre for Learning Innovation (DET CLI) became a partner in the University of Wollongong University's *iSee* platform. In 2010, it began trialling *iSee* amongst primary school students and preschoolers from the Parkridge Estate, a new residential precinct in southwest Sydney (Broadband NSW, 2010; Wood C, 2010). One aim is to see how the children use the platform after school.

Swinburne University social researchers involved in the Smart Services CRC are also conducting user experience trials amongst its student cohort. A key component of the investigation is to evaluate the effectiveness of the video element, in which participants use natural human protocols to mingle with other participants, possibly enhancing the effectiveness of group interaction and collaboration.

With *iSEE*, the user is projected into the environment via a webcam, enabling natural expression in the synthetic space.

Safaei's research into human computer interaction leads him to believe that future virtual worlds will be controller and keyboard free. This is prefigured in the Xbox '*Kinect*' (formally '*ProjectNatal'*). Smart sensors will read our body language, voice, and environment, collaborating with search agents that retrieve information about us to determine intention. Interactive user-created environments and narratives will be projected onto surfaces for us, to interact with. He suggests one way to think about the combined impact of integrated camera/projectors, gesture recognition, motion semantics, and human tracking is 'Let it be' (Safaei, 2009). We will pull down our virtual environments from the data cloud, and do in it what we wish.

Tooling up

Preparing Australian schools for 3D interactivity begins with being technologically equipped. Computer equipment must meet virtual platform specifications - the capacity of the graphics card is relevant, and fast broadband connectivity optimises the experience. Under the auspices of the Rudd and Gillard Governments' $2.4 billion 'Digital Education Revolution' (DER), the National Secondary School Computer Fund plans to achieve a 1:1 ratio of computer to students (years 9-12) by the end of 2011 (DEEWR, 2010a). Further, through the DER program, the NSW Department of Education and Training (NSW DET) has embarked on a program that will see the delivery of wireless Internet access to all secondary learning spaces and laptops for secondary teachers over a four-year cycle (Wood C, 2010).

The laptops issued by NSW DET, the Lenovo *IdeaPad S10e* and the *ThinkPad Mini 10* have inbuilt webcams, with as video cards, the Intel *Graphics Media Accelerator 950* and the Intel *NM10 Express Chipset 200MHz graphics* respectively (TALE, 2010). According to Dale Linegar, a virtual worlds facilitator in the education sector, these machines are capable of hosting most lightweight virtual world platforms (Linegar, 2010). With this infrastructure in place, the use of 3D simulated learning environments can now be considered seriously.

Obstacles

The platform itself will often have limitations, such as lag and instability, and frustrations due to a lack of customer support, setup and registration can all but jeopardise projects, as a Victoria University team found when using *Second Life's Teen Grid* in their 'Avatar Project (Schutt, Martino and Linegar, 2009).

Open social worlds can present some perplexing issues around governance, as regulatory elements are largely in the hands of developers. Subscribers have limited rights over the environments in which they have invested, and are subject to end user license agreements (EULA) over which they have little or no input.

Should a virtual world collapse, users have little to no recompense for their digital assets, and storage of their virtual assets is not usually an option due to lack of interoperability and IP concerns. Real-world authorities are always in catch-up mode as virtual world practices evolve, and are uncertain about how to regulate public virtual worlds, especially where illicit acts such as money laundering, tax avoidance, scams, harassment, and theft are concerned. These are some of the reasons why educators seek to use platforms that sit behind their institutional firewall.

Which Platform?

In a study on the use of virtual worlds in U.K. and U.S. higher and further education sectors, John Kirriemuir determined that Second Life was the platform of choice, citing profile, longevity and its international cohort as factors working in SL's favour (Kirriemuir, 2009). More recently however, access restrictions, the complexity and cost of setting up an island, user verifications and security protocols, (especially in Linden Lab's former service for 13 to 17-year olds, the *Teen Grid*), have challenged schools with scant resources.

This has caused a drift to other 3D competitors. *VastPark*, developed in Melbourne, is designed for cloud–based server storage and therefore is suited to large-scale projects. As a flexible platform with an open APIs, it has forged contracts in the education, military, aviation and government sectors,

including the Victoria Government's Department of Justice, which is exploring the potential for a virtual 'Youth Peer Panel' tribunal for young offenders (*VastPark*, 2010).

Demonstration version of the 'Virtual Youth Peer Panel', Department of Justice, State Government of Victoria <http://www.court.vastpark.com/youthpeerpanel/>

'Second Classroom', a Sydney-based network for teachers using 3D interactive spaces is keen on *Reaction Grid*, based on the stand-alone server platform *OpenSim*, for its cost effectiveness, flexibility and ease of use. 'We want to support innovators, on the ground, wherever they may be - big school, small school, whatever the setting' writes Dean Groom in the group's blog (Second Classroom, 2009). Still in the alpha phase of development, this 'PG' world designed for educators can be part of a shared grid, or sit behind the firewall. It has the same client as *Second Life*, and theoretically, content can be transported from *Second Life* to it; though currently it does not work the other way around.

Steve Collis, from the Northern Beaches Christian School is another advocate for *Reaction Grid*. He cites Linden Lab's pricing structure and its platform's inflexibility as reasons for his shifting preference. (Collis, 2009a).

Open Universities Australia is developing a virtual university using *web.alive*. As a private virtual environment it will enable teaching and may be used as a platform for hosting learning applications (Crock et al, 2009). The research team, Michael Crock and Tracy Engwirda, propose a virtual campus featuring small rooms for collaboration, scenario rooms for learning in context (such as a café, a court room, a boardroom), community areas (including lounge and auditorium) and administration and meeting areas, (such as small rooms for interviews and counselling). In a presentation delivered at the *Questnet 2009 Conference*, Crock and Engwirda outlined what they determined were *web.alive*'s strengths over other platforms. These included its ease of use, a seamless integration with the Web, its spatial audio facility, and that *web.alive*'s software-as-a-service model met Open Universities' needs.

Another consideration for educators is how platforms handle the integration of existing online learning management systems. *MOODLE*, for example, has been adapted for the 3D environment as *SLOODLE* (2010), and is used in a growing list of virtual worlds including *Second Life*, *Open Wonderland*, *Web Alive*, and *Real Xtend* (Kallonis, et al, 2010).

Virtual Environments versus other collaborative tools

Beyond the comparisons between virtual platforms themselves, how does the immersive Internet stack up against other collaboration tools such as video conferencing services (*WebEx*, Skype, etc.), beyond-the-firewall social networks (*Telligent, Yammer, Blue Kiwi*, etc.) or integrated software (Adobe *Connect*, Lotus *Sametime*, Microsoft's *Sharepoint, etc.)*? It is no easy task to establish conclusive answers as the arguments for and against are complex. First the requirements of the project itself must be aligned with the parameters of the tool. This requires not only a deep understanding of the projects aims, but also a good knowledge of the comparative functions of one tool over another. Then, once the chosen tool is implemented, the class or teachers need an acceptable level of proficiency with it. This is where quantifying key performance indicators become difficult[9].

In her 5,000 word treatise on the relative merits of *Second Life*, *OpenSim* and *WebEx*, self described 'machinimatographer and OpenSim activist' Zonja Capalini took into account average yearly cost, features, customer service and ease of use. She concluded that *WebEx* was the superior product, adding '*Promoting the use of Second Life or OpenSim as a tool for enterprises and educators, without adding big warnings or disclaimers, is the best way to actually delay adoption of the technology…*' However, upon publishing the blog post, no less than fifty lead users posted thoughtful responses either arguing an alternate view or providing updated information, which countered her findings (Capalini, 2010).

The chief limitation of *WebEx* and the like is that the users are still notionally fixed in a classroom; 'virtual learning' of this type is an extension of the bricks and mortar paradigm. Virtual worlds on the other hand are editable environments enabling interaction with objects, and (multiples of) people, in simulated spaces and scenarios, and this is absent in all other tools of collaboration. Users can interact with one another, exploring a range of scenarios, roles and emotions.

Many of the attributes of virtual worlds ones have already been mentioned (page 15-16), but beyond these is another key element: the ability to 'play'.

Games-for-learning are increasingly recognised as a means of developing strategic thinking, problem solving, interpretive analysis and creativity (McGonical; 2010; Seely Brown, 2009; Reeves et al, 2009). Users of *Adobe Connect* are unlikely to be fired with the kind of enthusiasm that students trialling *iSee* displayed, when, during a recent trial at Swinburne University, they spontaneously competed against one another to see if they could make their avatars jump onto the virtual table (Salomon, 2010). How does one assess the value of this? Unstructured time, 'schmoozing' as one enterprise user termed it, is valuable social and informal learning time. By accommodating multiple users, (multi-point to multi-point), virtual worlds promote group dynamics, the scope of which is simply not feasible in say a teleconference, and no matter how high is the level of customer support or service incentives, such services will not be able to deliver it. Likewise, the creative opportunities

[9] One initiative under the Federal Government's Digital Education Revolution is the ICT Innovation Fund's 'Anywhere, Anytime Professional Learning', a $5.4m teacher-training program for the 'virtual classroom'. The selected technology providers are Microsoft and Adobe, neither of whom currently supplies virtual world platforms.
<http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/DigitalStrategyforTeachers/Pages/ICTInnovationFund.aspx>

which virtual environments afford are simply not replicable in big tech desktop applications. Virtual worlds are infinitely editable; content can extend to the recreation of historical settings and the imagining of future ones; platforms are akin to blank canvases or empty film lots, sets, upon and in which class' imaginations can be given full reign.

The Project Funding Landscape

Any discussion on immersive technologies support is best seen within the context of the Federal Government's Digital Education Revolution, which has committed 2.4 billion over the seven years, 2009-16. Of this, $40 million has been allocated to professional development programs for teachers and school leaders. Within this parcel, a $16 million' ICT Innovation fund has selected four large-scale programs designed to equip teachers with digital readiness (DEEWR, 2009b). Significantly, none of these programs make any clear reference to virtual worlds or multi-user virtual environments. Similarly, the tools of the immersive Internet are omitted from the landmark Federal Government 2.0 roadmap 'Engage: Getting on with Government 2.0', (DFD, 2009)'.

An overview of the sector indicates that whilst some individual projects are being recognised, the immersive Internet industry (and this includes supporting services such as content makers, para-teachers and marketers) is not recognised as a sector in its own right. This lack of formal recognition is a signal that virtual worlds and their ilk are not on many strategists radar, and that near-future wide scale adoption is not anticipated.

And yet, user practice, outlined in the report, would indicate otherwise.

Fortunately the funding and research landscape is not entirely barren. Entities at the forefront of developments include Smart Services CRC industry partners: the NSW Department of Education and Training's Centre for Learning and Innovation (DET CLI) and the Australian Academic Research Network (AARnet). Both are assessing virtual platforms for near-future implementation.

AARnet, as the national provider of high speed broadband to the education and higher education sectors, is looking to establish bespoke virtual world software for internal use across its nationally distributed offices. The organisations' Applications & Services Director, James Sankar, believes this would not only bring useful new collaboration services to staff, but also see the need for a timely and strategic approach, given academic communities' evolving interest in immersive technologies (Sankar, 2009).

The 2008 University of Essex (UK) trials in which *Open Wonderland* was used as a demonstrator for mixed and simulated reality learning environments (Gardner, Ganem et al, 2008), have helped to shape DET CLI's view that virtual environments do indeed extend learning possibilities, and can be used to create 'a robust, safe, learning platform where' 'natural' collaboration is possible' (Wood C, 2009). DET CLI plans to integrate immersive technologies into its slate of education products such as the popular interactive online science game 'Murder Under the Microscope' and continues to lobby its uptake in education policy circles.

An energetic push to steer the future of virtual environments use in schools and higher education, in respect to developing an 'infrastructure, interoperability and policy framework' was begun by the National Interoperability and Digital Architecture Advisory Group (NIDAAG) in 2009. However, the project, 'PLanet' stalled in 2010 due to a reduction in support at the federal level (Millea, 2010).

The Australian Learning and Teaching Council (ALTC) has funded a number of virtual worlds research projects driven by UniSA's Dr Denise Wood, including two disability access projects worth upwards of $ 500,000 (Wood D, 2009).

The Flexible Learning Network has a national allocation of $2.65million for 2011 innovative e-learning projects in the TAFE/Vocational training sectors, and it has a track record for funding virtual environment projects (Flexible Learning Network, 2010)

Similar organisational moves are being made in the health sector with Stuart Smith, a senior researcher at the Prince of Wales Medical Research Institute initiating institutional support for Serious Games. Smith is hoping to establish an Australian/New Zealand consortium to promote 'Games For Health '(G4H) and is in discussion with the Federal Government's IT Innovation Council to enlist support (Smith, 2009).

The Victorian Health Promotion Foundation (VicHealth) has funded two 3-year projects, being the 'Avatar Project' (p.68) and *Connected Lives*, (Schutt, 2009). The latter involved children from Melbourne and Gippsland regions with disabilities including autism,. Other funding bodies supporting immersive service development include ARC, the Australian Teachers Learning Council, Centre for Creative Industries (CCI) and NICTA. The Smart Services Cooperative Research Centre has a dedicated Immersive Services stream, with the *iSee* platform, its cornerstone as well as a QUT team under Dr Ross Brown, researching the way virtual worlds can be used as workflow management systems, and a social research team based at Swinburne University of Technology (SSCRC, 2010).

At a state level, government agencies are looking to build broadband enabled services, and the climate for ICT funding reflects this. In Victoria, for example, the Institute for a Broadband Enabled Society (IBES) is developing a number of immersive and 3D projects, particularly in the health domain (IBES, 2010), and Multimedia Victoria (MMV), is embarking on Round 2 of its 'Collaborative Internet Innovation Fund' (cIIF). Whereas Round 1 was designed to develop Web2.0 enabled projects, Round 2, announced in October 2010, has a broader brief: to assist with the development of projects 'dependant on characteristics of the National Broadband Network such as its ubiquitous nature and high bandwidth' (MMV, 2010). A sum of $5 million has been allocated. Further project funding may be available within the context of the State Government of Victoria's 2010 $110million dollar 'ICT Action Plan'.

On the creative side, the Australia Council has funded at least three *Second Life* digital arts projects, two of which were to the value of $20k and $30k (Australia Council, 2009) and has instituted a 'Geek in residence' program, to service the digital component within creative practice. Screen Australia, along with state film agencies jointly funds the Laboratory for Advanced Media Production (LAMP) convened by AFTRS.

Screen Australia and Film Victoria have shown leadership with their joint 'Serious Games Initiative' in recognition of the emerging market. This program attracted 53 applicants, a significantly higher number than expected. Two projects were ultimately selected for development. Given the interest and potential, the funds allocation of $375,000 for 2009-10 is small, and needs to be compared with the investment made by the French Ministry for the Digital Economy program in which EU20m has been earmarked for developing 'serious games' (Telecom.gouv.fr, 2009).

Looking at the wider services sector, support for the industry is adhoc. Virtual world developers such as Keren Flavell (2009) and Bob Quodling of Simmersion (2009) point out that projects tend to fall between funding camps. This suggests that if Australia's home-grown innovation is to flourish, there may be a case for recognising the immersive Internet as an enterprise entity in its own right.

The avatar experiences multiple ‘selves’ in the ‘Doppelganger’ exhibition curated by the Australian National Portrait Gallery, October 2009.

Outlook and future strategies

"Formal education no longer comprises the majority of our learning. Learning now occurs in a variety of ways – through communities of practice, personal networks, and in the participation of targeted learning activities."

Nick Cross
Manager, Education Outreach, AARnet,
Questnet Conference,2009

As Nick Cross points out, the 21st century classroom will increasingly be defined by technology tools that cater for an extensible, customised approach to learning. This report began by setting immersive Internet technologies within this broader agenda, the challenge to reframe education services so that students can source and build knowledge bases, and extend their own learning by leveraging them through collaboration within shared networks. Flexible, editable, interactive, shared online environments are part of such a future, and given that well over 100 Australian education institutions are now exploring virtual worlds as learning environments, such tools are creating an observable trajectory.

On the negative side, stability, useability, security, integration into existing IT, and the need to set standards continue to challenge the rate of take-up. However, the more virtual worlds are used, the more their limitations are highlighted, and quicker is progress being made, with each new generation of virtual world architecture addressing previous shortcomings. Already a next wave is discernable. Avatars are becoming more lifelike, with many systems accommodating users' actual faces (*Teleplace, VastPark, 3DXplore, ProjectX, Mycosm*), and in *iSee*'s case, users themselves are projected into the virtual environment. A clear separation between services applications and social/game worlds is developing. Open APIs will drive participation from third party developers. In this respect, Open Source platforms such as *OpenSim, VastPark* and *Open Wonderland* are well positioned for future integration. Barriers to adoption such as maintenance and upgrades are being averted as services transition to being browser-based and hosted in the data cloud.

Next generation products (2010 onwards) are lightweight and better suited to mobile devices and now the iPad. They are capable of connecting to real-world data such as traffic congestion, shopping supplies, and entertainment events, translated as high-resolution, real-world imagery. As the technology develops, the physical world, enhanced by virtual overlays - augmented real-world environments - will become widely used and compliment screen-based, computer-generated worlds.

Interoperability and content transfer between worlds is currently limited to a few platforms such as *OpenSim* and *Second Life,* which share the same client. Moves towards an industry standard (X3D) are progressing, especially amongst the Open Source community, and the Boston- based Immersive Education Initiative (IEI 2010) has produced promising results in the quest to transfer content across five platforms[10]. This is exciting news for developers and consumers alike, as it means more flexible arrangements between institutions, and the ability to share and re-purpose content.

[10] The IEI's 'Platform Eco-system' comprises Open Wonderland, Open Cobalt, Open Simulator (OpenSim) and realXtend and Sirikata, the latter being developed at Stanford University

The roll out of government-funded laptops assists those with the vision. However, along with the program there may come a new digital divide, advantaging those with high bandwidth connectivity rather than those with access to the Internet *per se*. Without a ubiquitous efficient broadband infrastructure, the potential of immersive learning platforms with features such as spatial voice, the use of avatars to denote presence and for role-play, and the ability to create and share content synchronously amongst multiple uses, will be constrained. Multi-point to multi-point communication is the most compelling reason to embrace virtual world technology, and it is the communities of users, not the tools that give virtual worlds purpose and definition.

Addendum

Immersive Internet Australia was prepared using a range of methodologies. Whilst academic texts provided a necessary framework and departure point, fieldwork has been a priority, as the environment is developing rapidly, outpacing conventional publishing timelines. Research therefore has involved direct engagement with a global cohort of lead thinkers and users via blogs, social networks, wikis and industry conferences, emails, formal interviews and informal discussions. I wish to acknowledge the contribution made by this community, practitioners, explorers and inventors alike, for their valuable time and insights.

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Invitation to readers: Add your insights.

Events move as rapidly in the virtual world as they do in the atomic one. Whilst every attempt has been made to identify local initiatives, the list will naturally be incomplete. Readers are invited to add their projects and insights to the author's blog, *Digital Downunder*, as a way of updating the database (http://www.digitaldownunder.org). Look for the tab 'Immersive Internet Australia'.

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About the Author

Mandy Salomon is a senior researcher with Smart Services CRC, focusing on emergent web practices and their wider implications for the services sector. Mandy has shared her research amongst a diverse group of Australian business and NGO's including: TCCC, AIMI, AIIA, HISA, World Internet Project, Youth Council of Victoria, Parliament of Churches, Multimedia Victoria, Women In Computing, Asialink, Melbourne Grammar School, X/Media/Lab, Victorian Youth Services, Public Relations Institute of Australia and Online Banking Review. Internationally, she presented at the State-of-Play V, a collaboration between NYU, Yale and Nanyang University, Singapore. She is a foundation member of the Australasian Virtual Worlds Workshop and in 2009 co-edited The Journal of Virtual Worlds Research (University of Texas) edition on 'Virtual Goods and Trades'.

In 2008-9 Mandy wrote *Web Watch* for Fairfax Newspapers, a column which sought to bring emerging Web trends to a broad audience.

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