SHARING MORE THAN BANDWIDTH: ONLINE COLLABORATION IN THE ERA OF THE NATIONAL BROADBAND NETWORK

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Abstract

Central to discussions about NBN-enabled applications and services is the concept of online collaboration. This paper positions the software tool Adobe Connect, one of a suite of web services provided by the Adobe technology company, within the NBN-enabled services paradigm, and reports on the way it is being used to extend classroom learning in a NSW high school.

Keywords

NBN, collaboration, remote learning, tele-working, Zoo Connect, Adobe Connect.

Introduction

In spite of persistent scepticism by parliamentarians and non-government consultants (Turnbull 2011; Gans and Hausman 2011) about the need for a 'gold-standard' (Conroy 2010) National Broadband Network (NBN), the Gillard Government maintains that the proposed superfast fibre-to-the-home utility, will be leveraged to build a range of new services from which social and economic benefits will flow, and that by 2020, we will have taken our place at the top echelon of the world's digital economies (DBCDE 2011, p13). Amidst the public debate, end-consumers are considering if a 'lite' NBN version, with less capacity and geographic spread might not suffice, and, pointedly, what exactly are these much vaunted, promised new services (Allen Consulting Group 2011, vii, 27)?

It is this last question that provides the framework for our research.

US telecommunications strategist Raul Katz (2010, p. 1–3) notes that broadband only has an economic effect 'in combination with the adoption of information technology and the implementation of organizational process'. Added to this, he points out, is that 'without critical mass, the economic effect is minimal'. The last thing that NBN stakeholders would want is a high-speed utility that lacks useful services and therefore customers, or, conversely, a high-speed service that fails to enlist customers, which in turn stalls the creation of new services.

This conundrum can be sorted if technology developers adopt a user-centric approach to the design of their products, where users are acknowledged as the experts they are, in tasks they need to perform, and as such, are integral to the design process from the start (Leonard et al. 1997; Norman, 1998; Gaffney 2011, Bell et al. 2011; Barr 2010).

Counter-intuitively then, despite many users' uncertainty about the shape and form of the NBN, they are the ones best placed to inform the shape and design of future NBN-enabled services. It therefore follows that trials of new services are at their most valuable when, as far possible, they are conducted in situ, with real tasks to attend.

With this framework in mind, we explored the application of collaboration software[1] in an education setting. Our aim was not only to evaluate its use in the classroom, but also to extrapolate from this, the likely efficacy of such software in an NBN-enabled society.

Background to the trials

The National Digital Economy Strategy, released in May 2011, sets eight goals to stimulate thinking about new services; they are: to increase Australian business' and not-for-profit organisations' online engagement; to smartly manage our environment; to improve health and aged care; to expand online education; to increase tele-working; to improve online government service delivery and engagement; and to increase digital engagement in regional Australia (DBCDE 2011).

These are rich domains for innovation, and in consideration of them, we made a number of rough assumptions about Internet foundations upon which an energetic NBN digital economy will be built:

1. That services innovation will develop within an environment of net neutrality, open-data and open source.
2. That energy 'heat' created by the ever-increasing number of Internet server farms will be managed, so as to make online interaction and storage environmentally sustainable.
3. That cloud computing services will be a given.
4. That mobile devices with location-aware functions will continue their rate of uptake, and that they will work in consort with fixed-line services
5. That data-mining analytics will make content increasingly useful.
6. That users' trust in using online services will be maintained by secure authentication systems (encryption, biometrics etc).
7. That collaborative software tools will sufficiently evolve in order that groups and individuals can create teams, set goals, share tasks, manage documentation and work synchronously and asynchronously

The impetus for our research arises from the last point (7), the need for high functioning collaborative software tools. The most recent Australian Bureau of Statistics (ABS) figures on tele-working (2006) show that only 6% of the Australian workforce work remotely; Government would like to see 12 % by 2020 (DBCDE 2011: 6) However, telecommunications economist, John Deridder (2011), points out that with the ABS figures already five years out-of-date, the 2011 figure is possibly already in the 10 to 12% range. His estimate is supported by widespread high-speed broadband in urban areas such as in inner city Melbourne where cable broadband connection speeds regularly clock in at 6.9Mbps (Ayre et al. 2011). Clearly, a 12% tele-work force is not delivering the envisioned economic, energy, and resource and lifestyle efficiencies predicted, and a much larger percentage of the work force will need to be working remotely and in distributed ways if the Government's blue sky scenario in which Australia is a leading global digital economy is to be realised.

Key to increasing size of a remote and distributed work force is software tools that manage geographically dispersed teams as well as support creative outputs and agile, innovative work processes. In order to attract a critical mass, such applications need to work seamlessly, facilitating document iteration and archiving, supporting project management such as timetables and calendars, playing rich media including audio and video and enabling social interaction via chat, webcam and 3D environments. In two words, the tools must enable seamless collaboration.

This paper presents a summary of our experiences with the collaborative software tool *Connect*, one of a suite of web services provided by the Adobe global technology company. Our research tasks were to a) assess its performance within current urban broadband bandwidth parameters, b) to gain a deeper understanding of the use case for collaboration tools, and c) suggest how such services might evolve in an environment of superfast broadband.

Zoo Connect: Using Adobe Connect to bring the zoo experience into the classroom

Description of the technology

Adobe® Connect™ is an enterprise web conferencing application for online meetings, eLearning, and webinars designed for corporate and government agencies. Although not strictly immersive, Connect provides a 'rich' 2D environment supporting interactivity involving multiple participants, enabled by the Adobe Flash® technology upon which it is based.

Adobe Connect should be capable of running on a range of platforms including Windows, Mac OS, Linux, Solaris and most Mobile platforms. A minimum bandwidth of 512Kbps in recommended for end users such as participants and meeting attendees. Wired connections of cable DSL are recommended for administrators, presenters, teachers and meeting hosts. Minimum network requirements are 100Mbps Ethernet, with 1Gbps.

An *Adobe Connect* session is hosted and run by a nominated 'administrator' who handles the collaboration tools, which are displayed as 'pods' on the screen user interface. Pods include text chat, notes that can be saved and emailed, questions and answers for multiple presenters, 'whiteboard', integrated audio and video conferencing, interactive attendee list, and survey polls/quizzes. Content can be presented in a variety of content types including animated presentations, images, audio, video, and more. It can be saved as reusable templates and stored in libraries. Desktops and files can be shared.

Description of the trial

In August 2011, NSW Department of Education and Community's Curriculum and Learning Innovation Centre (DEC CLIC) and some of their Smart Services Cooperative Research Centre partners ran trials evaluating the effectiveness of the *Adobe Connect* enterprise web conferencing software tool in the secondary school classroom. The Zoo Connect trial described in this paper used *Adobe Connect*, version 7, to deliver a science lesson from Taronga Zoo in Sydney to students situated in the remote location of their secondary school, Carlingford High School.

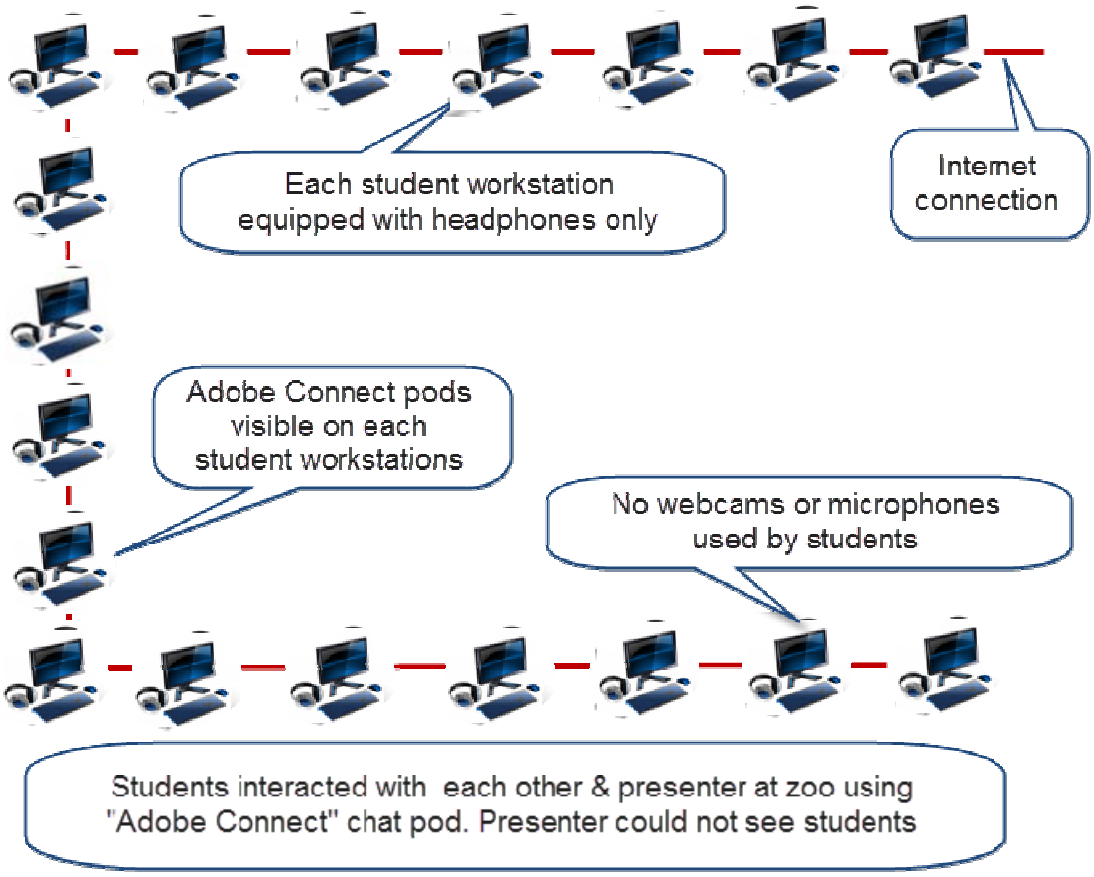

Figure 1: The Carlingford High School setup. Diagram design by Stephen Sergis, DEC CLIC, NSW.

A pretest-posttest control group research design incorporated both qualitative and quantitative methods for capturing data from students and teachers. Data sources included screen capture, video, survey instruments and teacher interviews. Two expert zoo instructors delivered the lesson remotely to an accelerated-learning class via *Adobe Connect*. A control group, comprising a mixed-learning class, were given the same lesson in their own classroom, with their regular science teacher. Although the learning characteristics of the groups were not equivalent, test results were statistically analysed by ANCOVA so that posttest results could be adjusted for differences in pretest scores.

The lesson experience

The science lesson covered classification of living things from the NSW DEC Stage 4 Science Curriculum. The *Adobe Connect* lesson screen was visible to two zoo instructors, 26 Stage 4 (aged 12–14) students in their school's computer laboratory, and several remote observers scattered across NSW and Victoria.

With the first zoo instructor acting as administrator, the following features of *Adobe Connect* were utilised in the Zoo Connect lesson:

- Live webcam/audio of the zoo instructors, mainly of the first instructor. At the end of the lesson the webcam transmitted live footage of the first instructor feeding a baby possum.
- Attendance register of students in the class
- Archival video of animals in the zoo and their classifications
- Two presentation/slideshows, each with live narration by one of the two instructors
- Chat pod moderated mainly by the second remote instructor

- Multiple choice and short answer polls for a pretest, posttest and a questionnaire that surveyed the students' experience of the lesson and the learning environment. Poll response summaries were displayed upon completion of all polls.

The chat and webcam pods were available for most of the lesson. The webcam pod was removed from the screen at times to award greater screen space to the presentations and both pods were removed during the polls. The text-only chat pod functioned well but time lags were evident in the other pods. The audio did not always synchronise with the webcam video or presentation. The video from both archive and webcam regularly lost resolution and blurred.

Students and instructors agreed that the interface was easy to learn and use. In response to the questionnaire and in their chat pod entries, students were extremely enthusiastic about the class. They reported high levels of engagement and particularly appreciated the ability to interact with each other as well as access to expertise and experiences unavailable in the normal classroom. They were motivated to ask for more and deeper content and they wanted the experience again. Their only criticism of the class was related to bandwidth restrictions, which regularly caused sound and images to blur, lag and freeze. This criticism was found in approximately 50 chat entries and 20 questionnaire responses.

Observations and results

Survey responses revealed strong agreement that students were cognisant, and extremely appreciative of remote access to expertise and a live environment that is unavailable in the classroom. The lesson was well-organised and made excellent use of the media available. The webcam images and voices of the instructors conveyed a sense of intimacy. The close-up webcam images of the baby possum invoked enthusiastic and empathetic responses from the students who were well aware of their privileged role as an audience.

Figure 2: Zoo Connect Screenshot. Students were self-correcting (peer-to-peer) in the chat pod.

In the Zoo Connect lesson, *Adobe Connect* was configured primarily for instructor–student communication. Students could see the instructor but the instructor could not see the students. The chat-pod was the only means of student–instructor communication, aiming to provide a channel for students to ask questions and receive answers from the second instructor who acted as a moderator.

Rather than ask the occasional question, students used the chat pod extensively, chatting to the class in general, broadcasting their ideas and comments to each other with an extraordinary 795 entries in 35 minutes. Over 710 of these entries were directly related to the lesson content or format. The instructors posted 18 responses. The advantage of text chat for these students was that they could 'talk' without interrupting the class. Although this extensive use of chat could be interpreted as superficial and even disruptive, it could also be viewed as maintaining attention and building a sense of community.

Content analysis of student questionnaire responses indicated that the predominant experience of the lesson was interactivity, followed by appreciation that they were exposed to a live and specialised learning experience not available in the regular classroom. Several students appeared to develop a strong sense of relationship with the instructors who appeared on their screen.


Impressions of the Sessions Chat

thomas g: AWESOME
Thomas C: This was awesome
Eda: its fun.....
james: ikr
Chris Nguyen: awesome session 8D
Jordan Shiu: awesome
Renee: great
Rachel 2: Bring more animals ???
Benjamin: ikr
Caitlin: It ROX!!!!!!!!!!
thomas g: better than skewl
Rachel 2: Yes
Song Fang: awesome session
Michelle: cool^^
Zakharia: it was good i liked it
Joshua: 7 outta 10
Shi Hao Hong: yep i enjoyed it definately
Lydia: a lot
Gilbert: revolutionary!
Jordan Shiu: yp
Julia Wilson: it was interactive and a fun lesson
Jordan Shiu: yep
Rachel 2: maybe bring in a orangutan :)
Rachel: it was great! "D
Alyssa: i loved this lesson. It was the best ever!
Matilda Howard: yeah, but i couldn't tpye fast enuf
Caitlin: 15 OUT OF 10
Song Fang: agreed thomas g
Eda: the animals were cute.... more live animals
Jordan Shiu: btter thanfb
Charles Pierotti: I've really enjoyed this session and hope we can do it again sometime!
Rachel 2: loved it
Mivin Mathew: it was very educative and informativei learnt new stuff
Gilbert: great work

Figure 3: Unsolicited responses from the class as the teacher concluded the session.

In review, the first Zoo instructor described feeling somewhat 'disembodied' without being able to see the class. The second Zoo instructor who was moderating the chat pod felt comfortable with the style of interactions. However both agreed it was extremely difficult to moderate the chat pod simultaneously with other Connect features.

Contextualising the Zoo Connect experience for an NBN-enabled remote learning/working environment

1. The Zoo Connect lesson demonstrated a high level of student engagement and teacher satisfaction and this outweighed the impact of the technology glitches (audio dropouts and lag) that occurred, *indicating that Adobe Connect, in this situation, satisfied users' engagement needs. Greater bandwidth would ensure that all multimedia features perform at the desired level*.
2. The posttest results showed that retention and understanding of the lesson content in Zoo Connect exceeded the results of the control group, *indicating that remote learning with Adobe Connect is pedagogically sound*.
3. As much of the lesson content is digitally stored, the lesson could easily be reproduced, benefitting remote communities where access to zoos and zoo specialists is severely restricted. *A fast broadband connection is required to deliver the lesson and its multimedia features to remote locations*.
4. With reference to the Zoo teacher's response that she experienced a sense of 'disembodiment', and in view of students' comments about wanting to the use webcams themselves, *we would see future services having two-way video link, or possibly graphical avatars within a simulated zoo environment*.
5. *We recommend further trials comparing Adobe Connect to virtual environments to gauge whether creating more deeply immersive experiences enhances online collaboration*. One 3D platform against which *Adobe Connect* could be benchmarked for this purpose is *iSee,* which is being developed by Smart Services CRC partners at University of Wollongong. *iSee* locates users, as avatars in a virtual environment, rather than a desk top pod. A live video feed of their faces is attached to the avatar, readily identifying students. It would be most interesting to use this facility to track the student cohort's relationship to the lesson content (for example, students might prefer to be gathered around the in-world video screen rather than the document wall). Another useful comparison would be in tracking students who loose engagement or do not keep up with the class; in both platforms, a distracted student is easily observed through facial expression and chat, however with *iSee*'s, a student's engagement within a space and in relation to the cohort may also be observed.

Concluding remarks

While many Australians are uncertain about the value of an NBN to them personally, there is widespread understanding that our future economy will primarily rely on the nation having effective bandwidth.

Already some 12% of our workforce use non-work spaces (home, cafes etc) to conduct their business, and schools are technology equipped thanks to the many facets of the 7-year, $2.4bn Digital Education Revolution, suggesting that on a user level, the nation is NBN-ready.

In trialling the collaborative software suite *Adobe Connect* in students' and teachers' own setting it, (the class room and the Taronga Zoo), the use case and the successes/limitations of the software were clearly demonstrated, as was the enthusiasm of the participants for this type of learning.

It is recommended, therefore, that digital services which bring greater flexibility to learning and work environments be prioritised for development and implementation, as they provide communities with useful tools for the here-and-now, assist managers in their thinking about organisational and cultural change, and give future NBN customers a strong sense of the possibilities that lie ahead.

REFERENCES

Allen Consulting Group 2011, 'Opportunities for small business and community organizations in NBN first release area', Feb 2011, http://www.dbcde.gov.au/__data/assets/pdf_file/0020/135506/Opportunities_for_small_business_and_community_organisations_in_NBN_first-release_areas.PDF.

Ayre R., Hinton, K., Gathercole, B. and Cornick, K., 2010, 'A Guide to Broadband Technologies', *Australian Economic Review*, Volume 43, Issue 2, pp. 200–208.

Barr T., 2010, 'A Broadband Services Typology', *Australian Economic Review*, Volume 43, Issue 2, pp. 187–193.

Bell G. and Dourish P., 2011 *Divining a Digital Future: Mess and Mythology in Ubiquitous Computing,* Mass: MIT Press.

Conroy, S. 2010. 'ICT Leaders' Debate' National Press Club (Canberra, Aust) on 10 August 2010, (video archive) retrieved January 2011, http://www.youtube.com/watchv=xRHbeONYdUc&feature=player_embedded

Corner, S., 2011, 'Turnbull's NBN Pricing scare gathers momentum' in *IT Wire*, (online news) 23 August, http://www.itwire.com/opinion-and-analysis/cornered/49323-turnbulls-nbn-pricing-scare-gathers-momentum.

Department of Broadband, Communications and the Digital Economy (DBCDE), 2011, 'National Digital Economy Strategy', http://www.nbn.gov.au/the-vision/digitaleconomystrategy/.

Deridder J., 2011 'Teleworking — An example of policy flying blind', *Economuse* (blog).

Gaffney G., http://www.infodesign.com.au/uxpod/beyondthelab.

Gans J. and Hausman J., 2011, 'NBN plan 'anti-competitive, economists warn', *Australian Financial Review*, 15 September, http://www.afr.com/p/national/nbn_plan_anti_competitive_economists_FyghHmocsYCsF8nUKvkThJ.

Katz, R. 'The impact of broadband on the economy: Research to date and policy issues' (Discussion paper) GSR 2010, www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR10/documents/documents.html.

Leonard, D. and Rayport, J.F., 'Spark Innovation Through Empathic Design', *Harvard Business Review*, Nov–Dec 1997.

Norman, D., 1998 *The Invisible Computer*, Cambridge MA, MIT Press.

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[1] Described in Wikipedia as 'Computer software designed to help people involved in a common task achieve goals', http://en.wikipedia.org/wiki/Collaborative_software, 2 October 2011.