
A Landscape Study of Shared Infrastructure Services

in the Australian Academic Sector

Document details

Author:	Jane Hunter, Director of the eResearch Lab, The University of Queensland
Date:	9 December 2009
Version:	Final
Document Name:	Australian-SIS-Landscape-report.doc
Notes:	

Summary

This document is a report on a Landscape Study of Shared Infrastructure Services in the Australian academic and higher education sector. It has been prepared for UKOLN and JISC, as part of an international study, comparing the situation between the UK and Australia.

Acknowledgements

This study was funded by the Joint Information Systems Committee (JISC) of the Higher and Further Education Funding Councils.

UKOLN is funded by the MLA: The Museums, Libraries and Archives Council, the Joint Information Systems Committee (JISC) of the Higher and Further Education Funding Councils, as well as by project funding from the JISC and the European Union. UKOLN also receives support from the University of Bath where it is based.

The University of Queensland eResearch Lab is funded by the School of ITEE and Faculty of Engineering, Architecture and Information Technology (EAIT) at the University of Qld, as well as the Dept. of Innovation, Industry, Science and Research (DIISR), the Australian Research Council (ARC), ARCS/ANDS and the Queensland Government.

Acknowledgements to contributors

The authors would like to thank the various people who contributed to the report by adding comments to the blog, by participating in the online survey and by supplying information in other ways. The authors take responsibility for interpreting the information collected and for any change of emphasis that comes with collating the viewpoints of the various contributors.

Contents

- 1 Executive Summary 1**
- 2 Introduction and Terms of Reference 3**
 - 2.1 Background..... 3
 - 2.2 Finding the evidence 3
- 3 Aims and Objectives 3**
- 4 Methodology 3**
- 5 Findings 4**
 - 5.1 Sharing Textual Documents 5
 - 5.2 Sharing Presentation Content 6
 - 5.3 Sharing Image Content..... 7
 - 5.4 Sharing Video Content 8
 - 5.5 Blogs..... 9
 - 5.6 Wikis 10
 - 5.7 Sharing Geographic Content..... 11
 - 5.8 Social Bookmarking..... 12
 - 5.9 Citations/References 13
 - 5.10 Instant Messaging 14
 - 5.11 Social Networking..... 15
 - 5.12 Personal Portals 16
 - 5.13 Virtual Worlds 17
 - 5.14 Calendars 18
 - 5.15 Notification Services 19
 - 5.16 Online Teaching..... 20
 - 5.17 Password Management..... 21
 - 5.18 Podcasts..... 22
 - 5.19 Video-conferencing..... 23
 - 5.20 Web Annotations 24
 - 5.21 Grid/Cloud Computing 25
- 6 Anticipated Future Trends and Recommendations..... 26**
- 7 Author contact details 28**
- 8 References 28**

Shared Infrastructure Services Landscape Study of the Australian High Education/Academic Sector

1 Executive Summary

The Australian Department of Education, Employment and Workplace Relations (DEEWR) and the Department of Innovation, Industry, Science and Research (DIISR) are administering a number of ANDS [1], ARCS [2] and NeAT (National eResearch Architecture Taskforce) [3] projects funded through the Platforms for Collaboration [4] component of the National Collaborative Research Infrastructure Strategy (NCRIS) and more recently through the Education Investment Fund (EIF) [5]. A range of e-Research services are being developed and promoted through these programs. Examples of such services include data registration and identification services, authentication services (AAF) [6] – as well as general collaborative services such as the EVO videoconferencing service, and shared content management and messaging services such as Sakai, Drupal, Plone and Jabber [7].

In parallel with these investments, it has become evident that users in the higher education and academic sectors in Australia are choosing to use main stream Web 2.0 technologies in their daily work activities. However there is limited knowledge about who is using which Web 2.0 technologies and for what purposes. Moreover there is little information about why specific tools and services are chosen when institutional or nationally-funded services are available. JISC recently funded a study in the UK to investigate the adoption of Web 2.0 services by the higher education and academic sectors. **The aim of this report is to survey the situation in Australia and hence enable comparisons with the UK.** This survey therefore focuses on the current and active users of Web 2.0 tools and services in Australian Higher Education institutions and aims to identify what they are using and why.

Although the UK leads Australia in the development of collaborative eResearch services, the results of the survey indicate that the adoption of Web 2.0 technologies in the higher education sector in Australia is not significantly dissimilar to the situation in the UK. Users prefer to use Web-based services that are already adopted by the wider community and that are free, robust, simple to sign on to, and easy to install and use. Examples include: FaceBook, YouTube, Skype and Twitter. Although the most active use of Web 2.0 has been by early adopters (people who are not afraid to try out new tools, experiment with them and promote them to colleagues and peers), this situation is changing as more Web 2.0 technologies are becoming broadly adopted by mainstream users. Because Australia has not had the same level of investment in cyber-infrastructure and lags behind the UK in the development of services, it has been able to take advantage of services developed in the UK and USA (e.g., RoMEO, Shibboleth) – as well as the recent explosion of free, open source Web 2.0 technologies. In some ways, this delayed investment has been an advantage because there is not an established pool of services that is being superseded by commercial and open source Web 2.0 technologies.

The survey has also shown that not all Web 2.0 tools and services are used to the same extent. The most popular services are the current market leaders: Facebook, YouTube, Wikis, Blogs and Twitter. As in the UK, the primary factors governing choice of service are: cost, ease of use/interface design, wide-spread adoption. The important factors in continuing use are reliability, efficacy and how much it is used by the user's peer group.

The fallout has been that users don't choose to use technologies that have specifically been developed by and for the eResearch community (e.g., Sakai, EVO) – unless they have been mandated by their research/peer group or institutional IT service providers or if there is nothing else available through the Web. The SWORD APP Profile [8] and RoMEO [9] are examples of such services not available elsewhere. Generally the perception is that services developed by and for the higher education and research sectors are less robust, problematic, difficult to use, poorly documented and not widely interoperable.

The lack of support in universities for freely available Web 2.0 technologies has led to tension between users, IT support and central management. University IT departments are often seen as “controlling” and obstructive. Users want to be able to download, install and use software services such as Skype onto their desktop computers or laptops – but often they do not have administrative rights to do so. There also exists a level of tension between mandated technologies (e.g., EVO) and widely adopted mainstream technologies (Skype) that both serve essentially the same purpose, but have different levels of support and security implications.

Many Australian institutions and faculty IT support are struggling to maintain both the security of content and services whilst also maintaining the flexibility required to support changing users’ needs. Slowly universities in Australia are beginning to adopt and support Web 2.0 services through their libraries and IT service departments. This is expected to grow over time in response to user demand. Universities also realize that although many staff and students are familiar with using Web 2.0 services, there may also be a need to provide training and support in these new technologies to more mature staff members or those staff and students from less technical disciplines.

The following table summarizes the results of the survey by identifying the most popular software for each service type and the top three reasons given for choosing this.

Type of Service	Preferred Tool	Top 3 Reasons
Sharing Text	GoogleDocs	Free/low-cost, easy to use, reliable
Sharing Presentations	SlideShare	Easy to use, free/lowcost, recommended
Sharing Images	Flickr	Easy to use, free/low cost, widely used
Sharing Video	YouTube	Easy to use, widely used, free/low cost
Microblogging	Twitter	Easy to use, free/low cost, widely used
Blogs	Wordpress	Easy to use, free/low cost, widely used
Wikis	GoogleDocs/MediaWiki	Free/low cost, easy to use, reliable
Maps	GoogleMaps/Google Earth	Free/low cost, easy to use, widely used
Social Bookmarking	Delicious	Free/low cost, easy to use, widely used
Citations	EndNote	Widely used, easy to use, reliable
Instant Messaging	GoogleTalk/MSN Messenger	Free/low cost, widely used, easy to use
Social Networking	Facebook	Widely used, easy to use, free/low cost
Personal Portals	iGoogle	Free/low cost, easy to use, reliable
Virtual Worlds	SecondLife	Free/low cost, easy to use, recommended
Calendars	Outlook Calendar	Mandated, local support, easy to use
Notification Services	RSS/Atom	Free/low cost, easy to use, widely used
Online Teaching	Blackboard	Mandated, local support, easy to use
Password Management	OpenID	Widely used, easy to use, interoperable
Podcasts	iTunes	Easy to use, free/low cost, widely used
Video/audioconferencing	Skype	Free/low cost, easy to use, widely used
Web Annotations	Diigo	Free/low cost, easy to use, widely used
Grid/Cloud computing	Grid	Mandated, local support, interoperable

2 Introduction and Terms of Reference

2.1 Background

Like JISC, DIISR in Australia has in recent years funded programmes that provide shared infrastructure services and shared platforms for the Australian HE sector (e.g., Systemic Infrastructure Initiative (SII) and NCRIS 5.16 Platforms for Collaboration). This funding has supported a range of pilot and demonstrator projects (DART, ARCHER, NeAT projects) as well as established and customized eResearch services (ANDS and ARCS).

The general view of services developed specifically for and by the higher education sector, is that they are not as robust, less user-friendly and not easily interoperable compared with services provided through the wider Web environment. Some services have to be used because there is no other choice e.g., identifier services, collection registries, AAF.

As in the UK, Australian academic sector users who once relied on institutionally provided tools and services, now also turn to tools and services developed outside the sector by both commercial global enterprise and the open source community. The aim of this report is to identify the Web 2.0 technologies that are most popular and what they are being used for.

2.2 Finding the evidence

Currently there is very little quantitative evidence of the adoption of Web 2.0 technologies. This study will provide a snapshot of what Web 2.0 services are currently being used by HEI in Australia. The project timescale and available resources precluded a comprehensive survey approach comprising interviews with large numbers of individuals. The approach therefore involved an online survey, together with a limited number of case study interviews.

3 Aims and Objectives

The study aims and objectives are:

- To inform JISC of the current use of Web content services by the Australian academic sector;
- To identify the services which are most commonly used by the academic sector in Australia;
- To identify the uses made of these services;
- To identify the significant service features that influence the choice of service;
- To compare this with the current use of Web content services in the UK.

4 Methodology

In order to collect relevant information as quickly as possible, the following methods were employed: a literature search, a blog and an online-survey.

The web survey was sent out to relevant email lists in Australia including the ANDS, ARCS and AAF discussion lists. Colleagues promoted the study via blogs, tweets and email.

The areas targeted are those Web 2.0 tools and services that are most popular and most likely to be used by staff and students in the academic and higher education sectors.

5 Findings

There were 48 participants in the online survey from a broad range of disciplines and sub-sectors (teaching, research, general and administrative staff, library and IT services staff, post-grad and undergrad students).

The detailed outcomes of the survey are presented graphically in the following sub-sections.

The results indicate that until recently the use of Web 2.0 services was primarily for personal use or within individual project teams. This is changing - increasingly research projects and associated collaborators are including Web 2.0 technologies in their project proposals to enhance collaboration and document sharing and to expedite information dissemination. In addition, lecturers and students are using Web 2.0 technologies (Wikis, blogs, social bookmarking and social networking) to share information and lecture material and to collaborate on assignments. This has led to accelerated growth in the adoption of these technologies both to facilitate work activities and in an effort to be seen as keeping up-to-date with the latest technologies.

The other recent change is that Australian institutions are increasingly adopting Web 2.0 technologies – usually driven from the marketing or PR department and/or the university library. For example, the University of Queensland home page (www.uq.edu.au) includes *Social Media* links to relevant UQ content on Flickr, Twitter and YouTube. The Australian National University (ANU) includes a link to podcasts of recent public lectures on its home page (www.anu.edu.au). The University of Queensland library hosts a range of blogs on different subjects (<http://www.library.uq.edu.au/services/blogsindex.html>).

A summary of the survey results, future trends and recommendations is provided in Section 6. But the feedback from survey participants and interviewees indicated the following reasons that users choose to use Web 2.0 technologies.

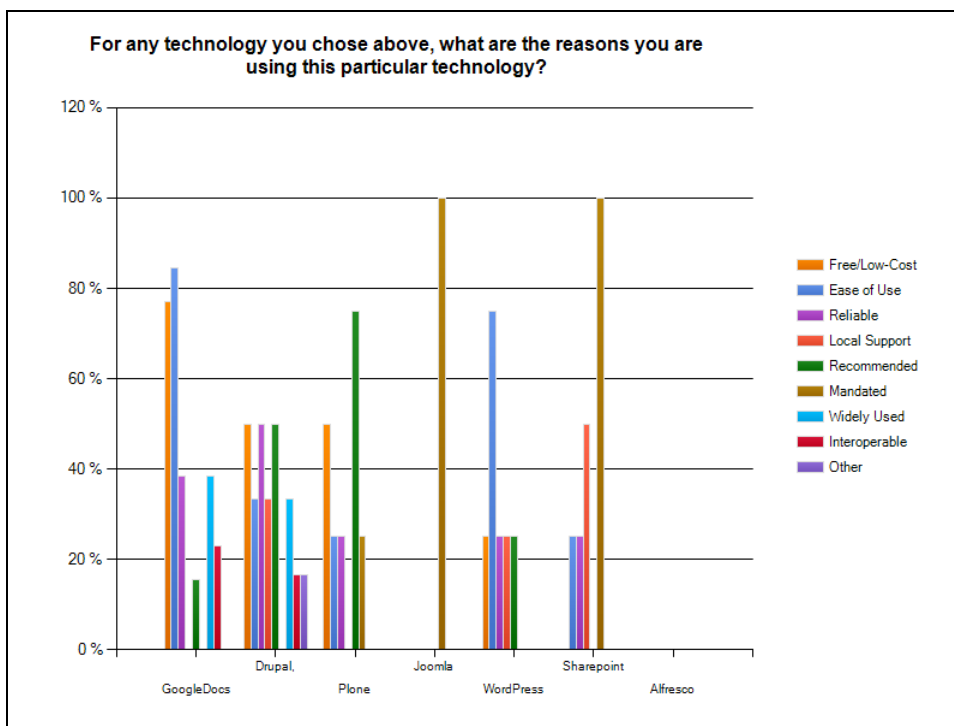
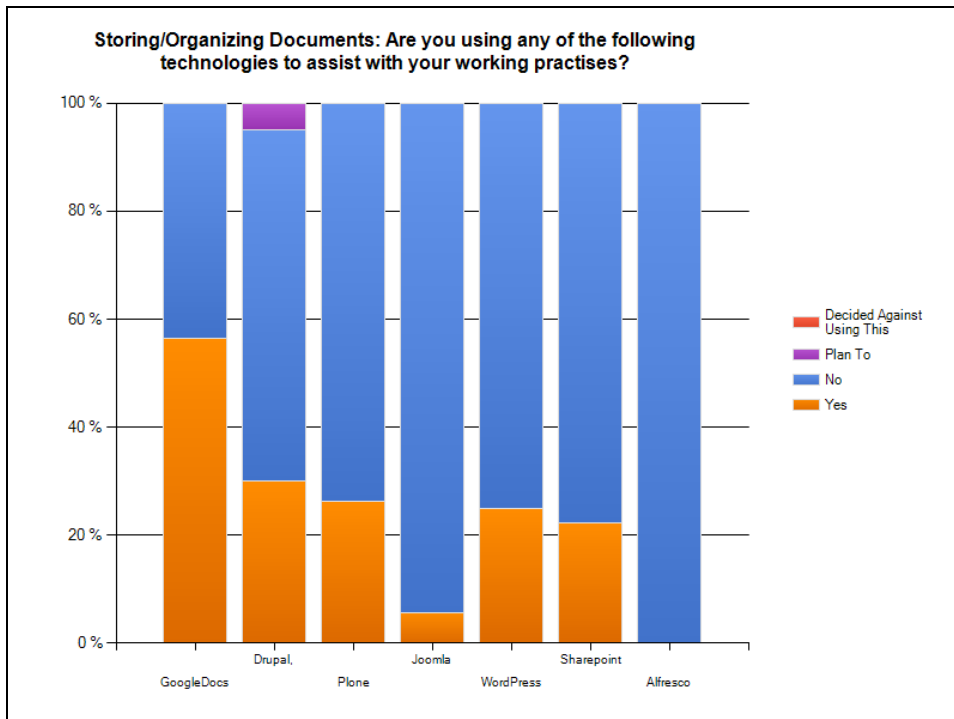
The major advantages as perceived by users are:

- Using Web 2.0 services typically requires no (or minimal) direct financial investment.
- Sign-up procedures are usually simple;
- The majority of technologies are very intuitive, quick to learn and easy to set up. This has led to the situation where people tend to experiment with a wide variety of different tools and to change preferred tools relatively frequently.
- The services are generally very reliable, robust, well supported and widely used.
- Because users are already familiar with these technologies through personal use – using them within the workplace precludes the need to learn new tools or new user interfaces for the work environment.

Perceived disadvantages of Web 2.0 services include:

- The lack of support from university or faculty IT service departments;
- Inability to easily download and install software from the Web due to restrictive university IT policies;
- Lack of quality control and trust associated with social networking, social bookmarking and social tagging sites;
- The inability to easily transfer data from one service to another (e.g., bookmarks between Delicious and Zotero) or to retrieve data if a service closes (e.g., a blog hosting site).

5.1 Sharing Textual Documents

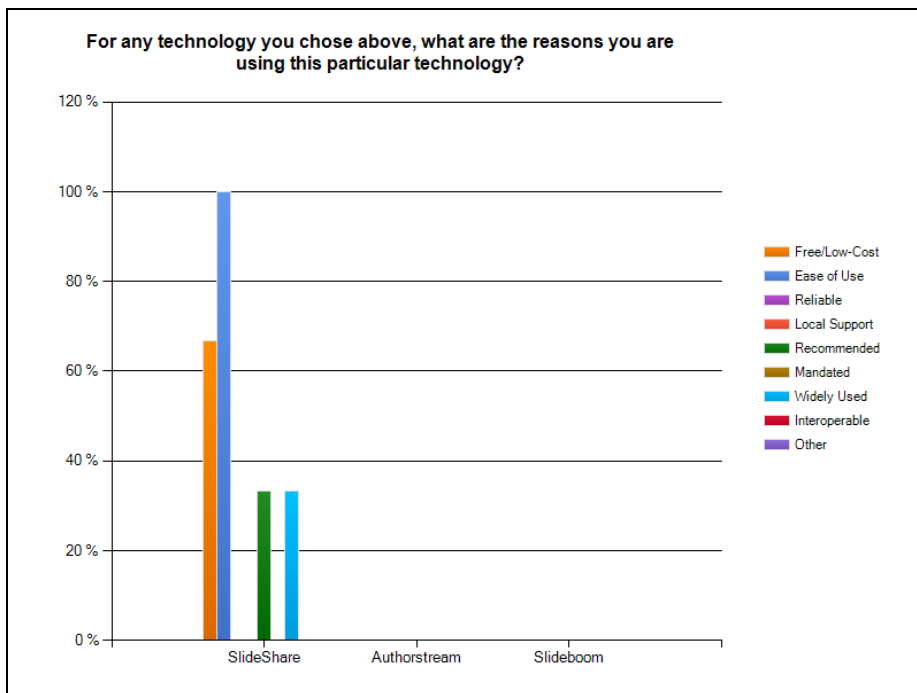
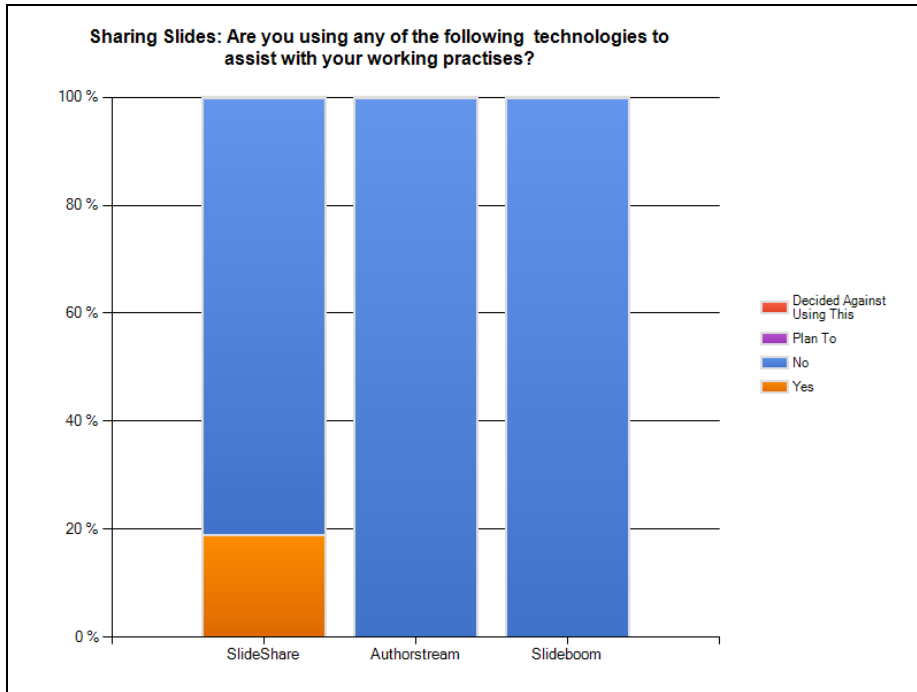


GoogleDocs is the most commonly used software for sharing text content. The reasons given for using it are that it is free, easy to use, widely deployed and reliable.

Drupal is also used but not to the same extent as GoogleDocs.

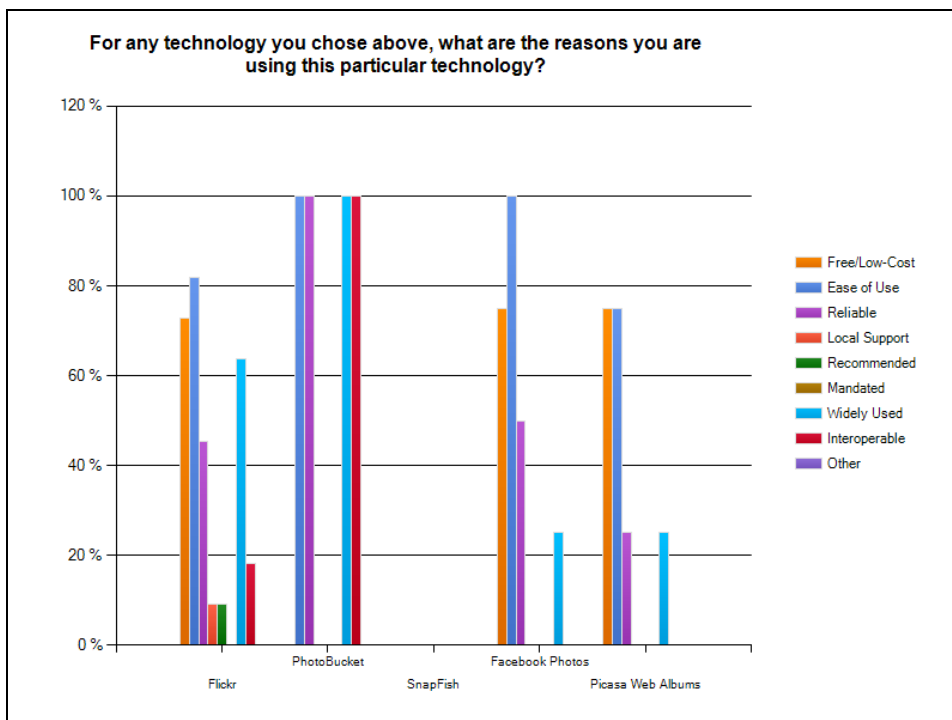
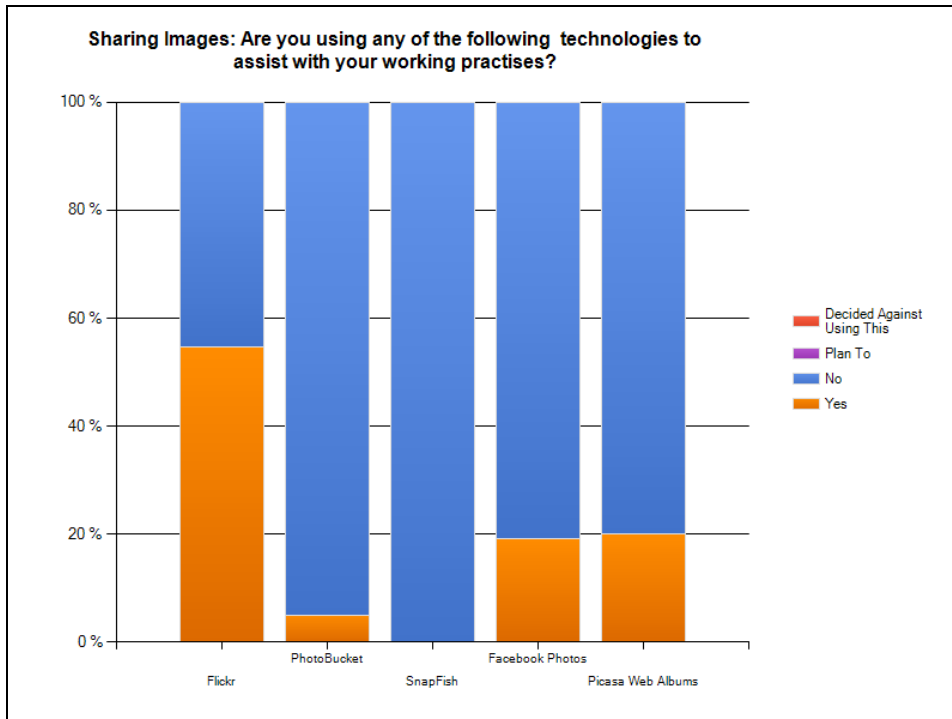
MS Sharepoint is also used but primarily because it is mandated by a group, project or organization.

5.2 Sharing Presentation Content



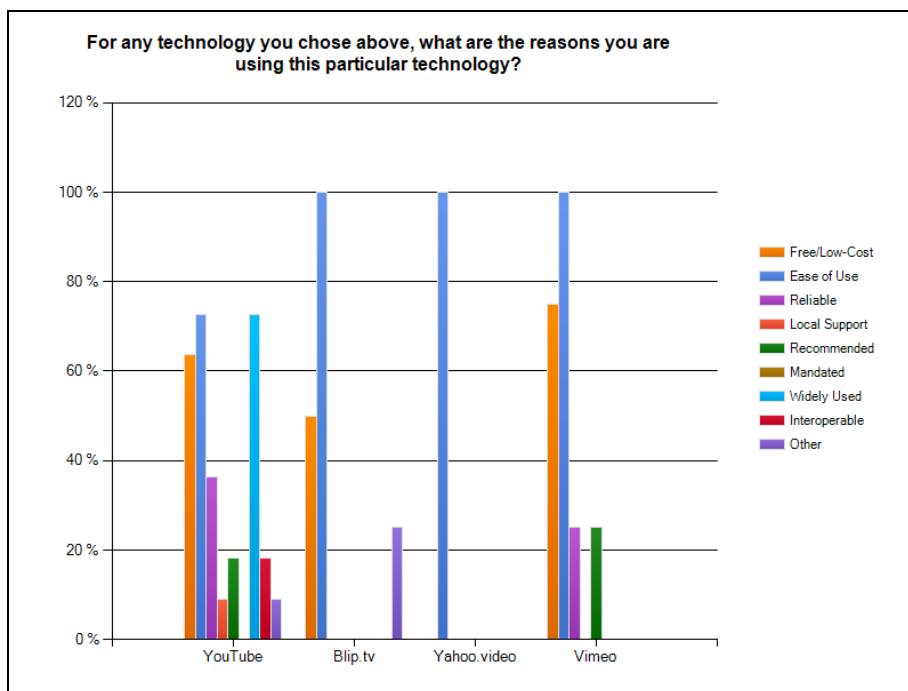
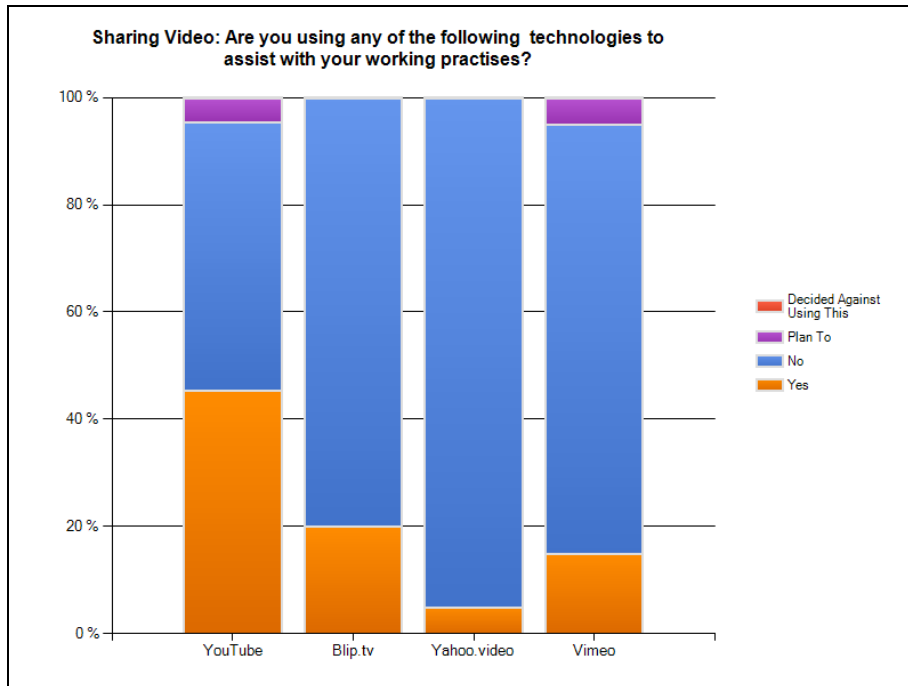
Slideshare is the most commonly used service for sharing presentation content – reasons cited are that it's free, easy to use and widely adopted.

5.3 Sharing Image Content



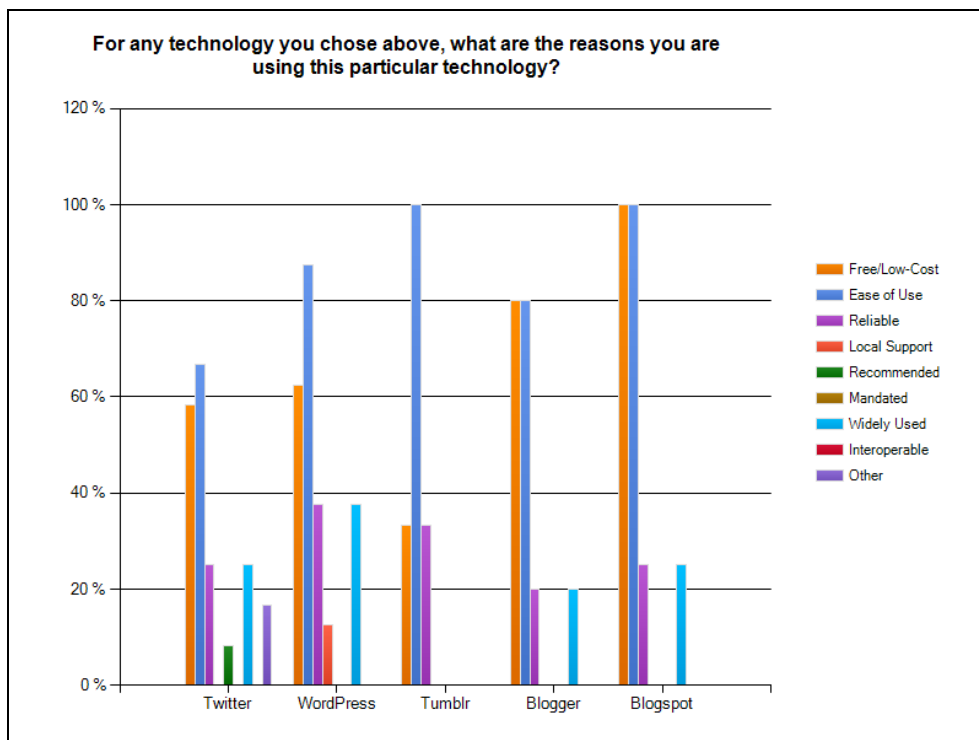
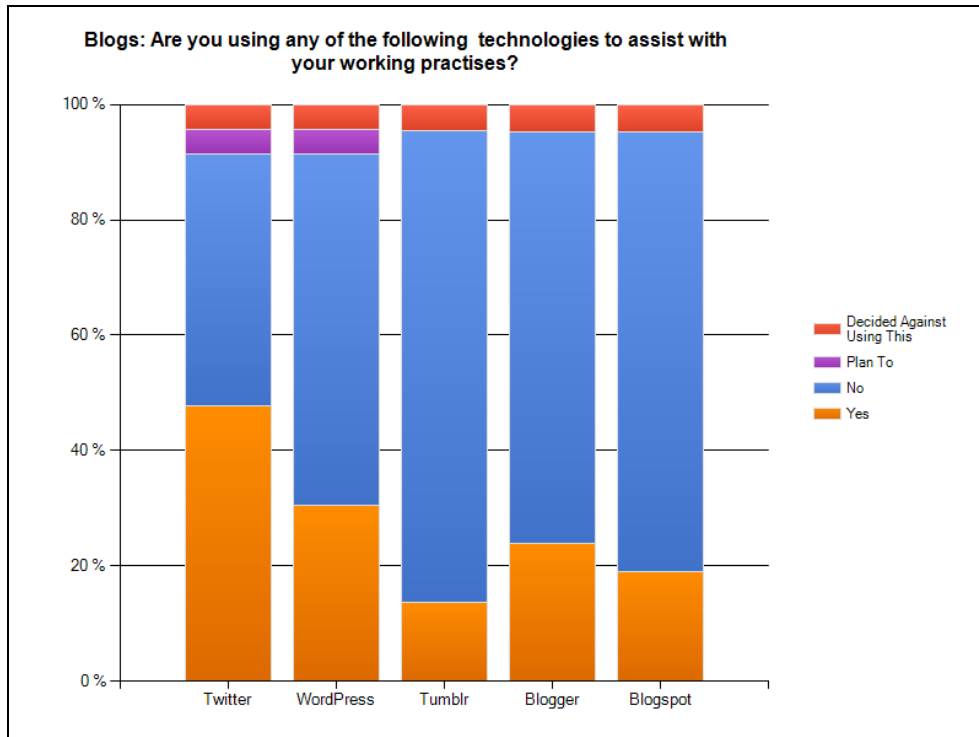
Flickr is the most commonly used service. Reasons given are because it is free, easy to use and widely adopted. Many institutions, departments and research projects upload content to Flickr to enable rapid sharing of content and community tagging.

5.4 Sharing Video Content



YouTube is the most commonly used technology for sharing video content associated with demos, teaching, research and marketing. The main reasons for choosing it are that it is free, easy to use, widely adopted and very popular. Uploading videos to YouTube ensures maximum dissemination of content and associated publicity.

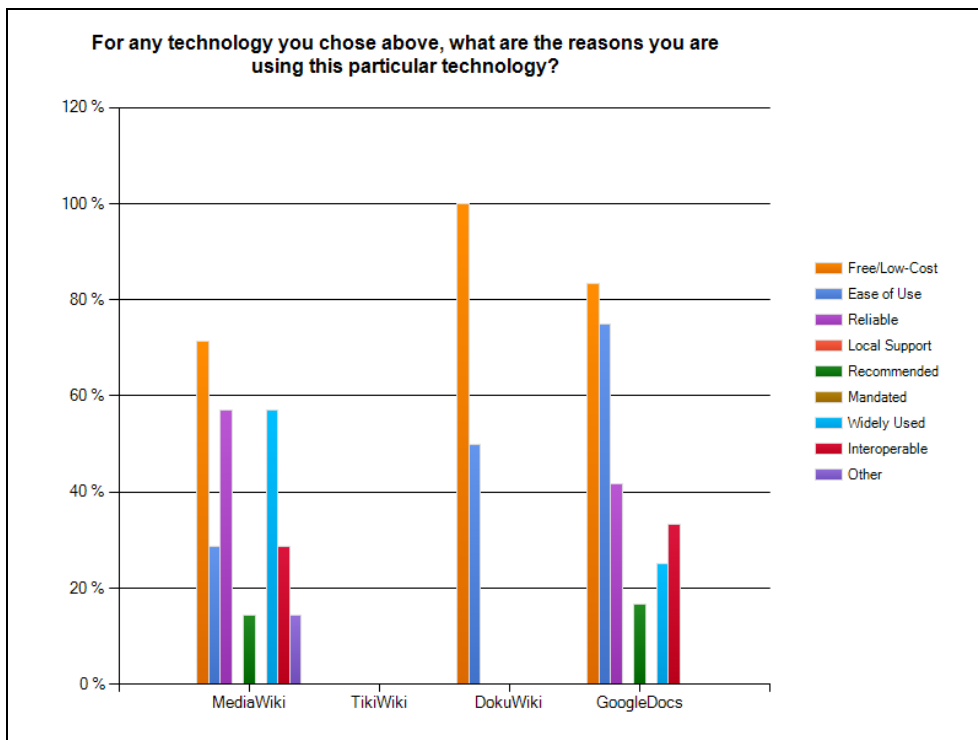
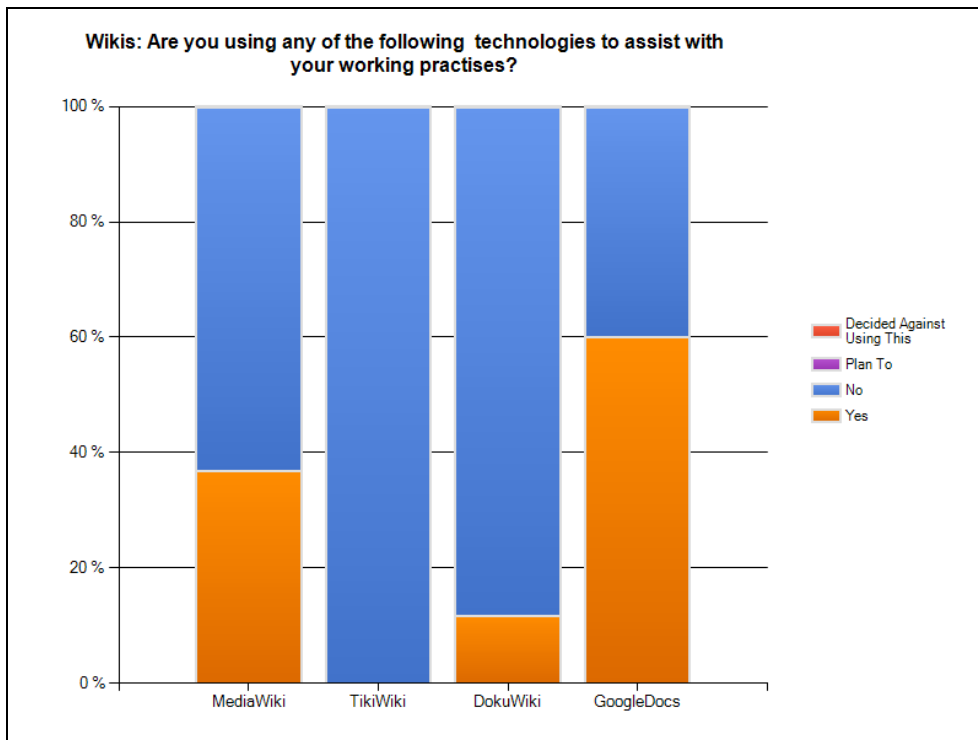
5.5 Blogs



Blogs are being used for sharing information about projects or topics. Closed secure blogs are used to share information within project teams only. Postgraduate students are also using blogs to record research notes, interesting references and progress reports. More recently users have started to move to micro-blogs (Twitter) because they take even less time and effort to broadly publish ideas, events and messages.

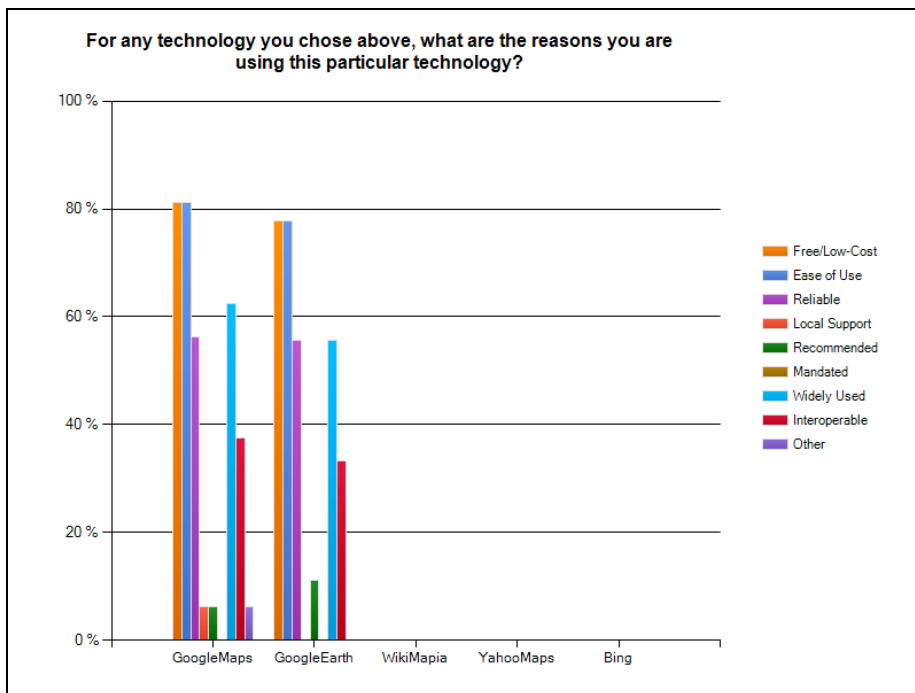
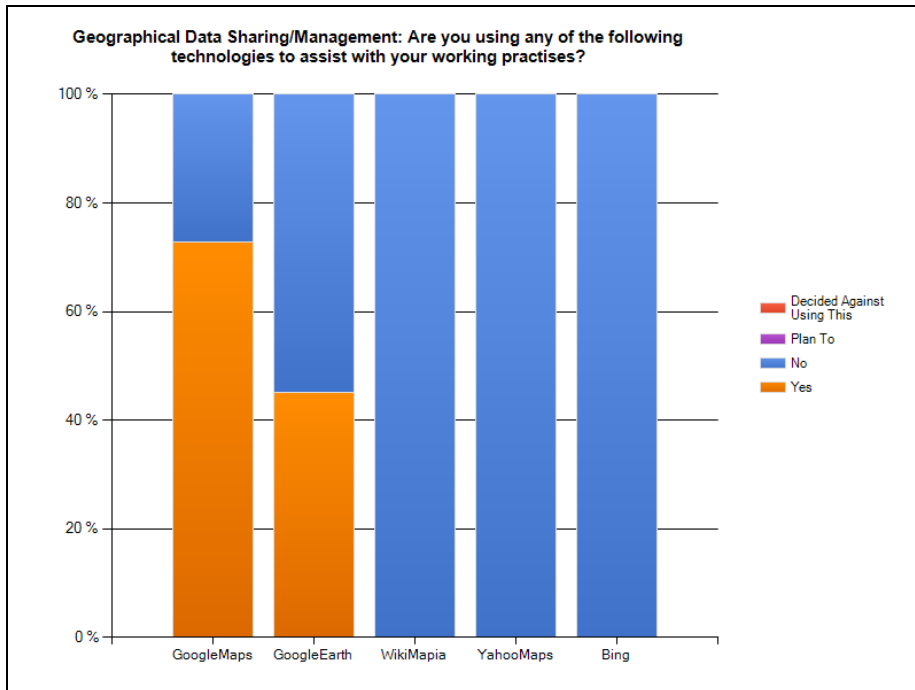
Twitter is the most popular blog/micro-blogging tool because it is free and easy to use, has a critical mass of users, a well-used API and there are numerous associated services. Twitter is also regarded as a very easy mechanism for generating interest, for getting quick answers to questions and for gaining a reputation as an expert in a particular field (whether justified or not).

5.6 Wikis



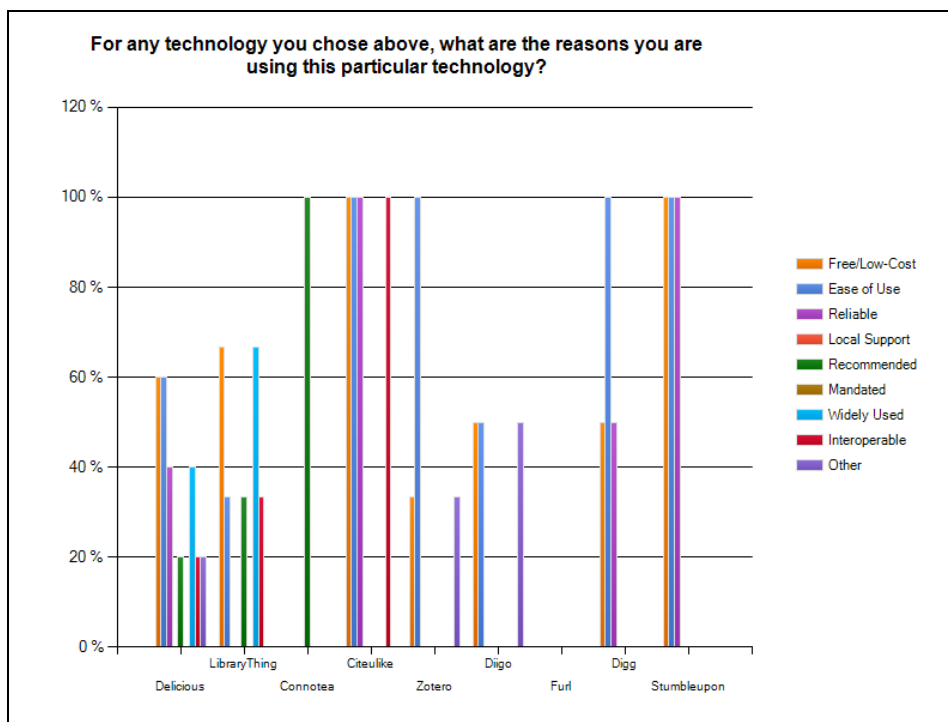
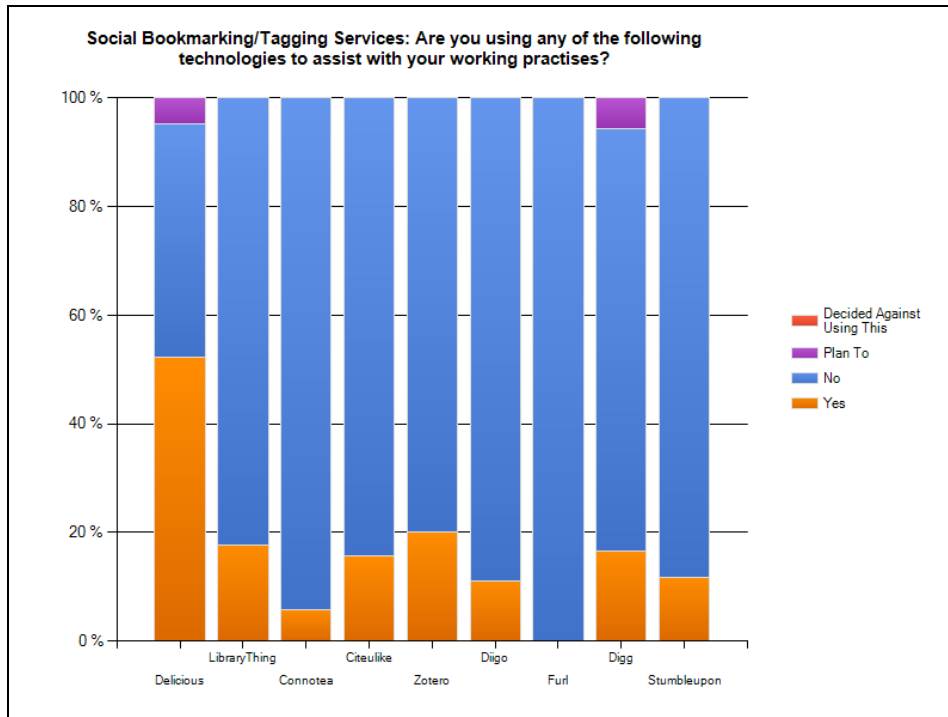
The most popular Wiki tools being employed by projects are GoogleDocs and MediaWiki – they are both seen as low cost, easy to use, and reliable. Wikis are widely used by research groups or student groups/lecturers to collaboratively generate documents and websites for research projects or teaching programs.

5.7 Sharing Geographic Content



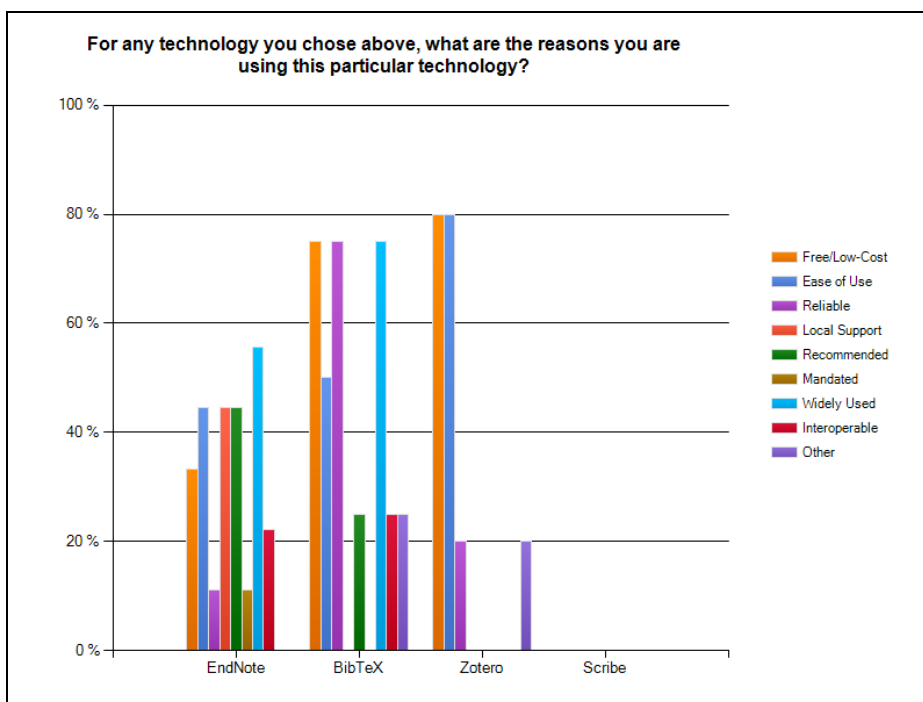
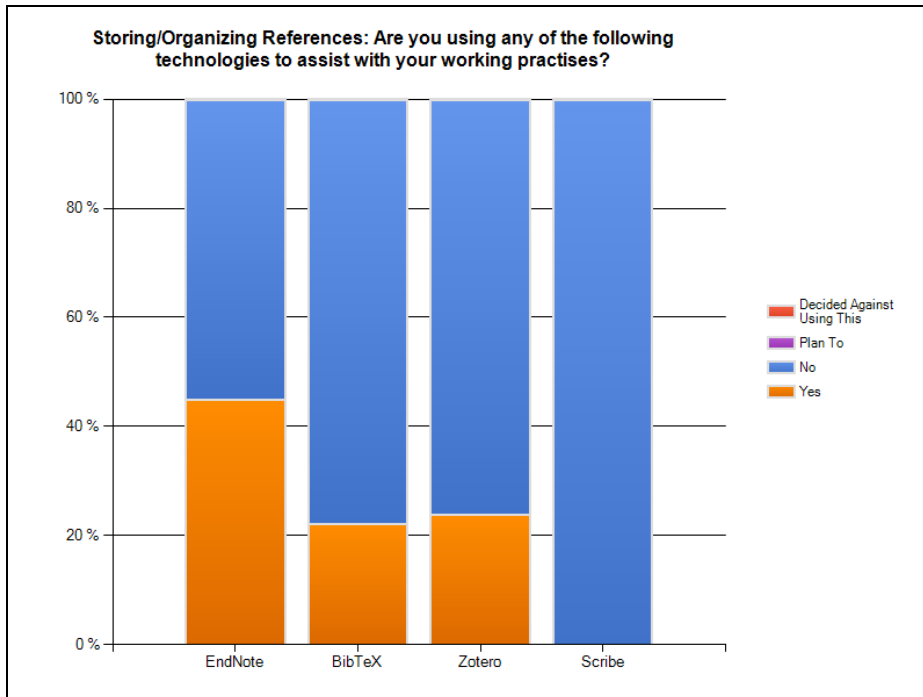
GoogleMaps has been widely adopted: by universities for publishing maps of events etc.; and by research groups for publishing spatial data. It is popular due to its ease of access and functionality, well-documented API and reliability. Microsoft's BingMaps have not been widely adopted to date.

5.8 Social Bookmarking



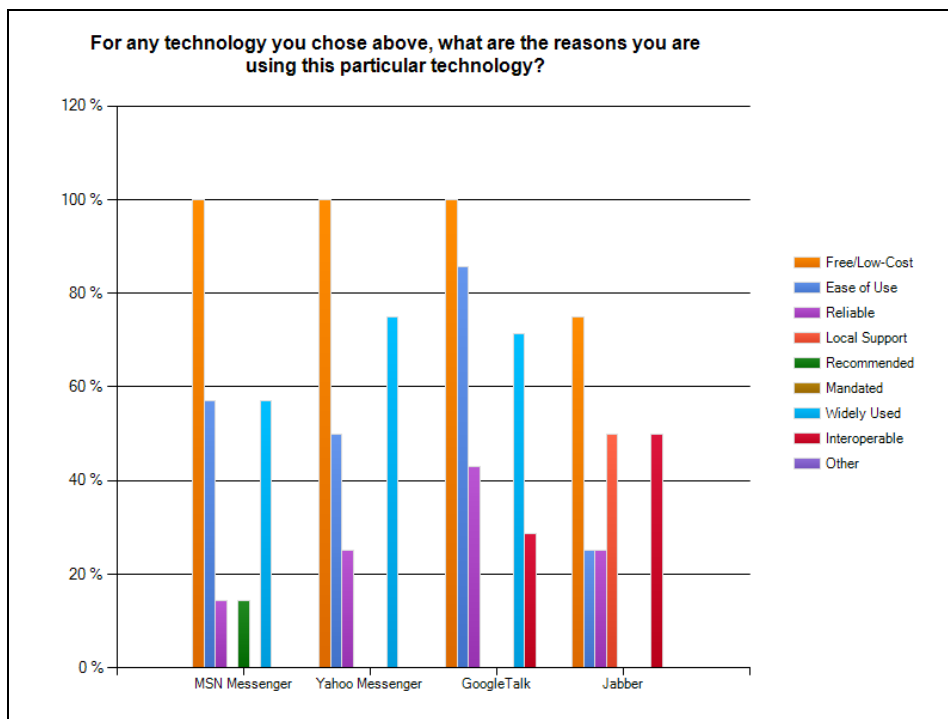
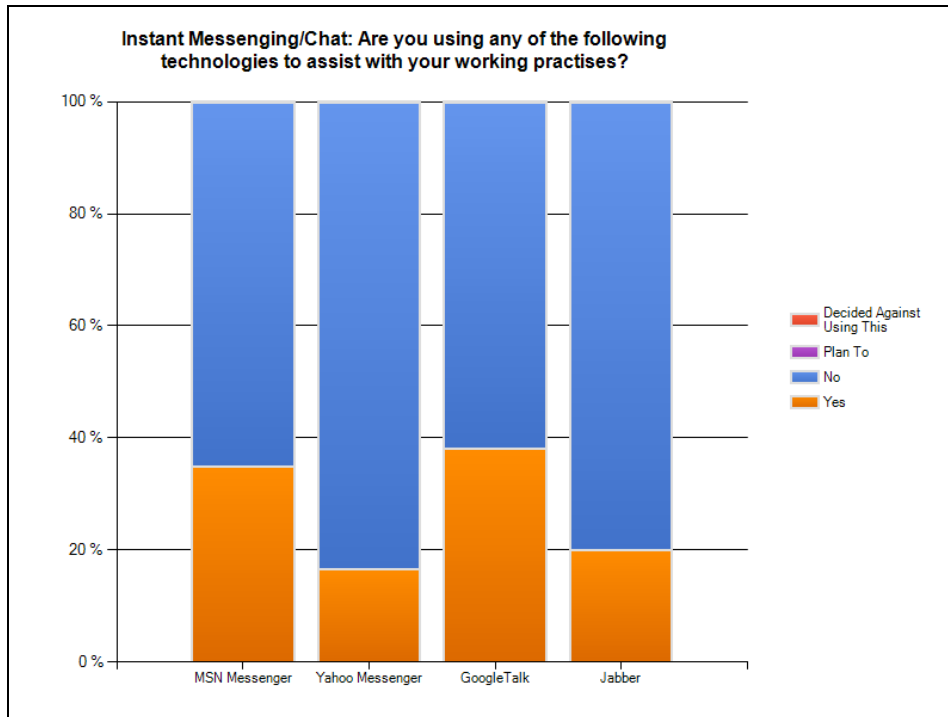
Social bookmarking services are increasingly popular. They are seen as a flexible way to bookmark and share Web sites on relevant resources with colleagues and collaborators. The advantages are that they can be accessed from anywhere and they support multiple types of content (web pages, blog posts, RSS feeds, content sharing services for images, slides and video). Delicious is the most popular choice, for being free, quick to set-up and simple to use and maintain. Zotero, LibraryThing, Diigo and CiteuLike are popular for managing one's own work and for building a database of useful web pages. Social bookmarking tools (e.g. Delicious, Bibsonomy and Citeulike) are also sometimes used by lecturers to assess students' reading materials.

5.9 Citations/References



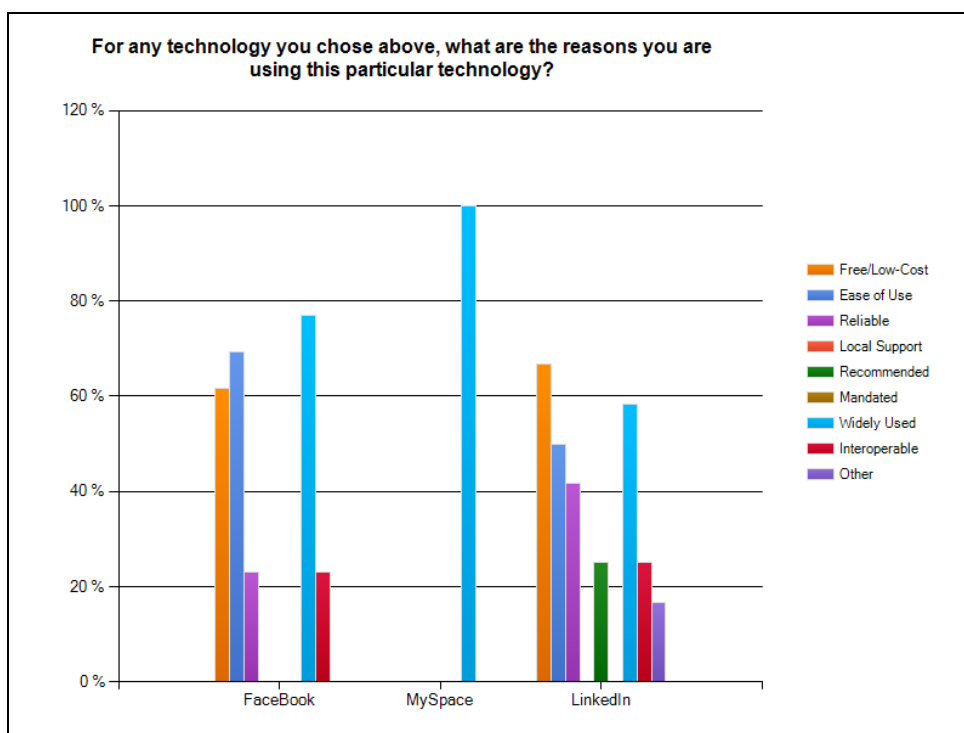
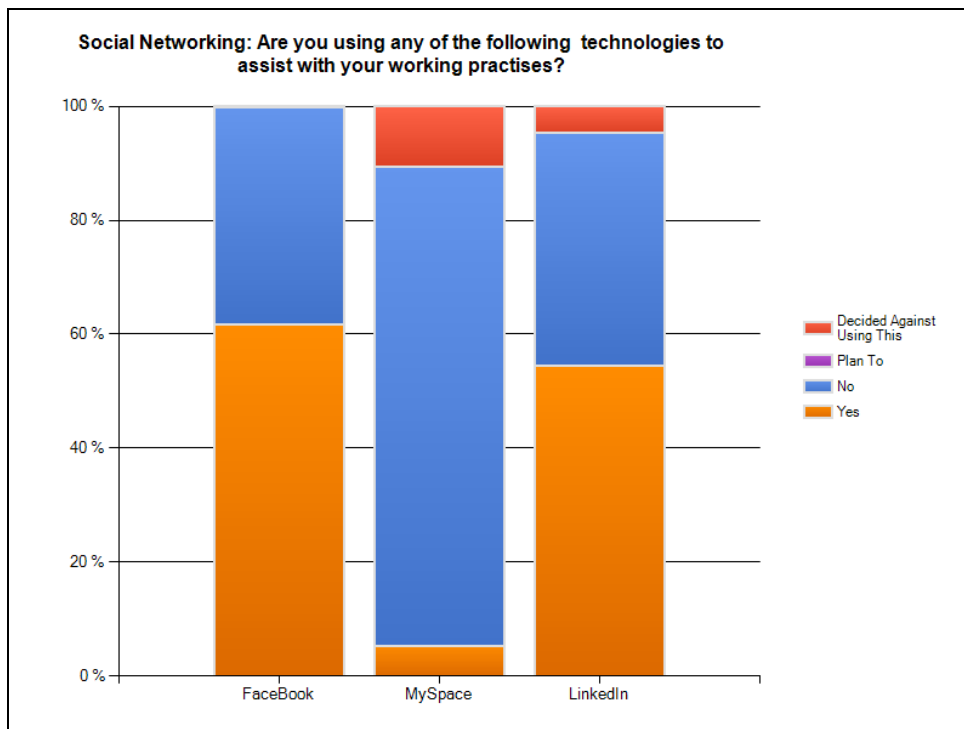
Endnote is the most popular citation management software because it is mandated and supported by most academic institutions in Australia. Zotero is also popular for bookmarking, tagging and sharing recommended readings.

5.10 Instant Messaging



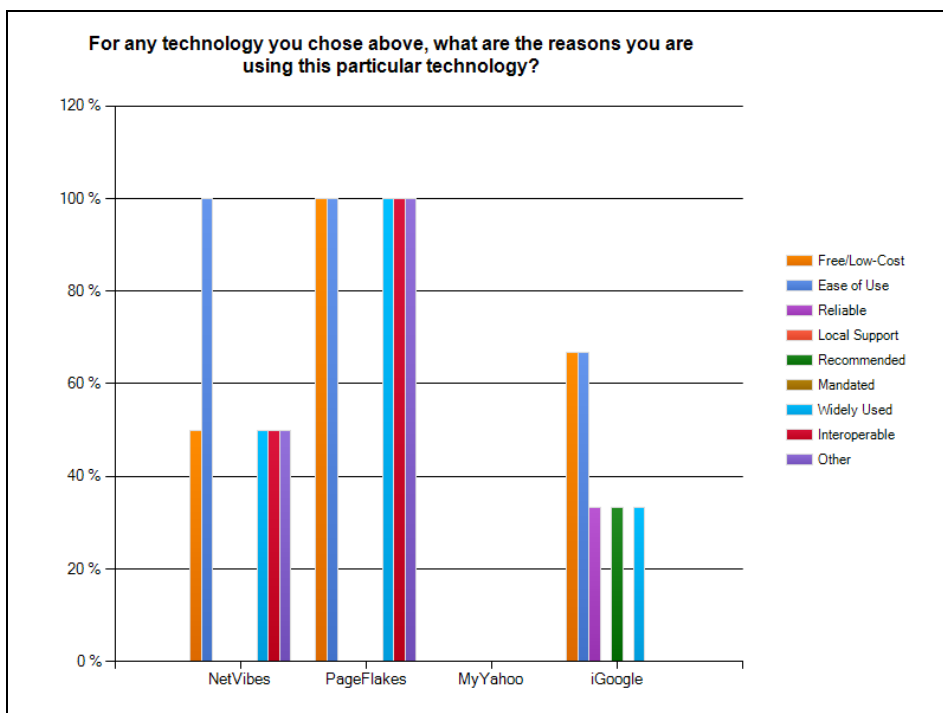
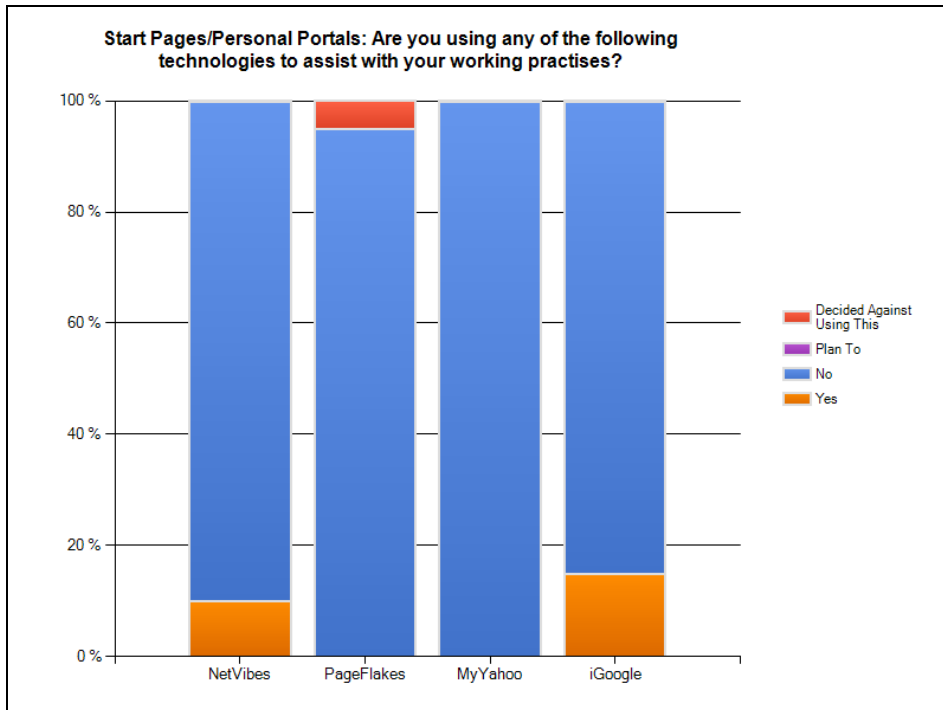
MSN/Windows Live Messenger used to be the most popular chat tool but GoogleTalk appears to have become more popular recently. Other popular IM services are Yahoo! Messenger and Jabber. Participants said that they like instant messaging because conversations can be quick/brief and less disruptive than telephone, email or face-to-face conversations. There are some associated risks (security (spyware, viruses, worms etc), compliance risks and inappropriate use) and archiving challenges.

5.11 Social Networking



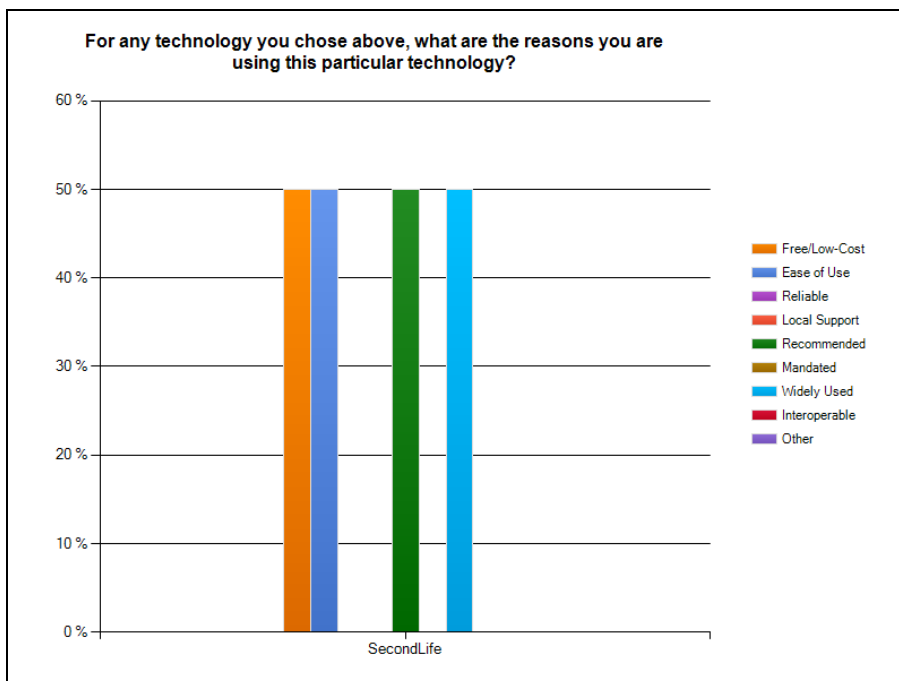
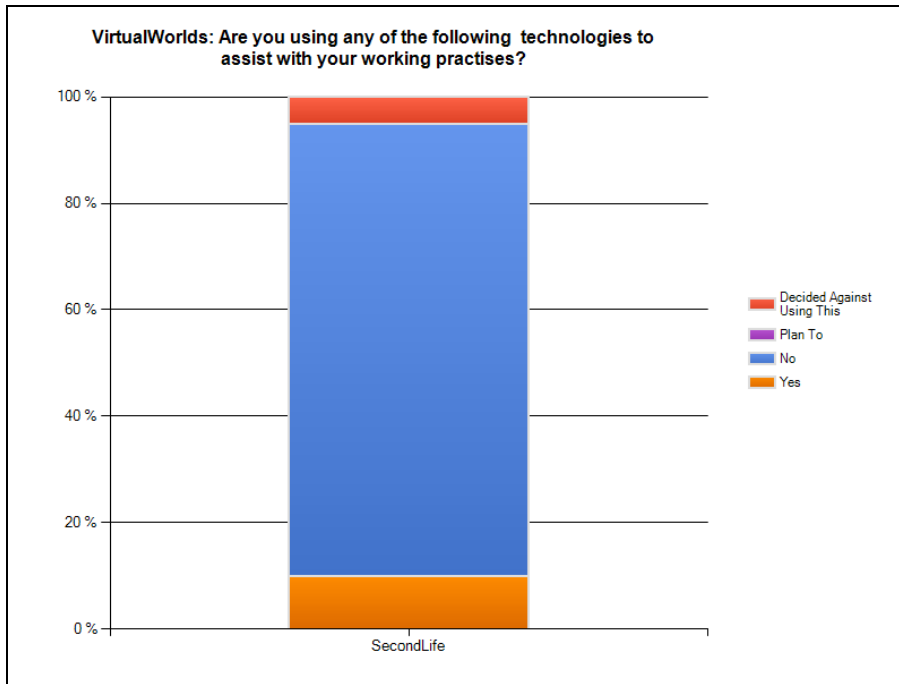
Social networking sites are being used to reduce the isolation of distance learners and for cooperative learning and research activities. Facebook is the most popular service amongst the surveyed participants. LinkedIn is the second most popular but is not very active and considered more business-oriented and US-centric. Different social networking sites also have their own demographic audience e.g., MySpace is popular with younger (secondary school) students. Some institutions are using social networking sites to maintain contact with prospective and current students and alumni.

5.12 Personal Portals



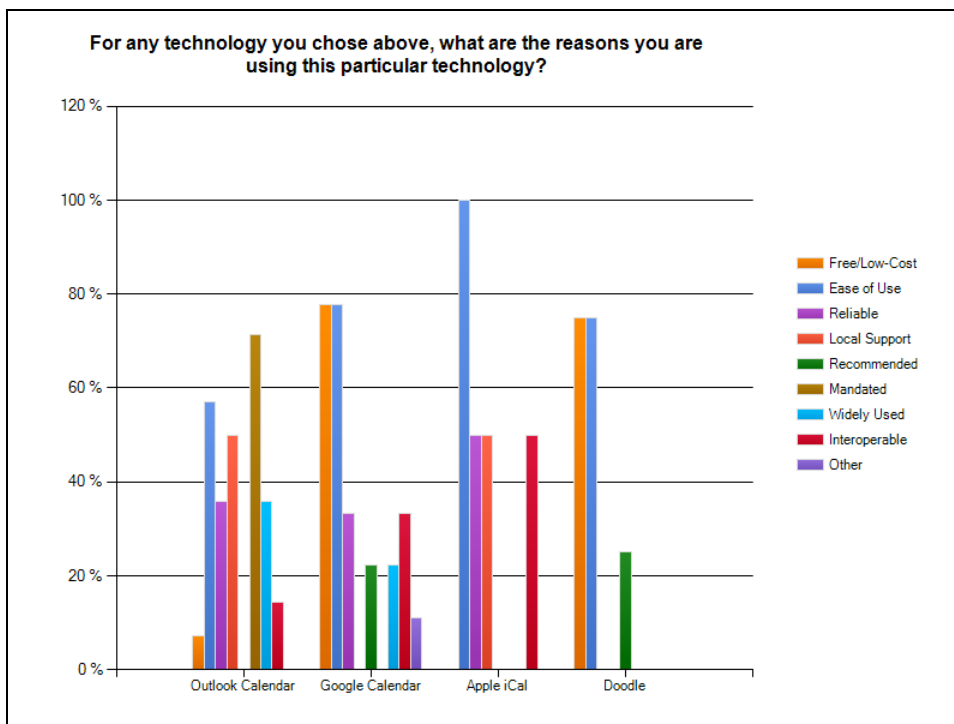
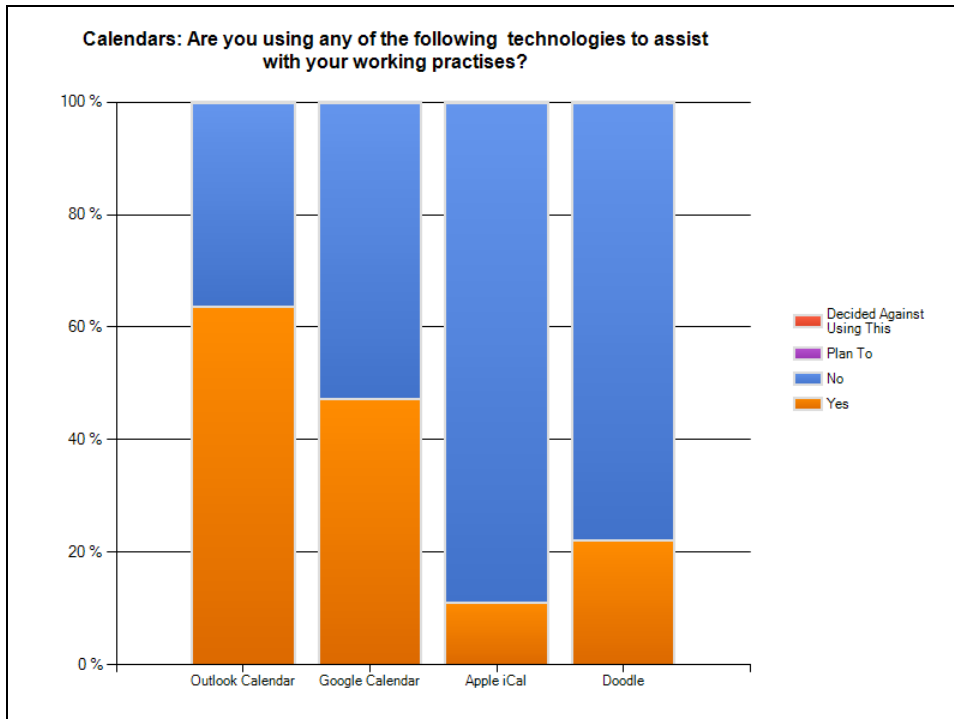
Personal start pages enable people to bring together various services (Twitter, RSS and blog feeds, a 'to-do' list and frequently used bookmarks) in one window. Currently they are not widely adopted in the Australian HE sector. However, of those users who have used them, iGoogle is the most popular.

5.13 Virtual Worlds



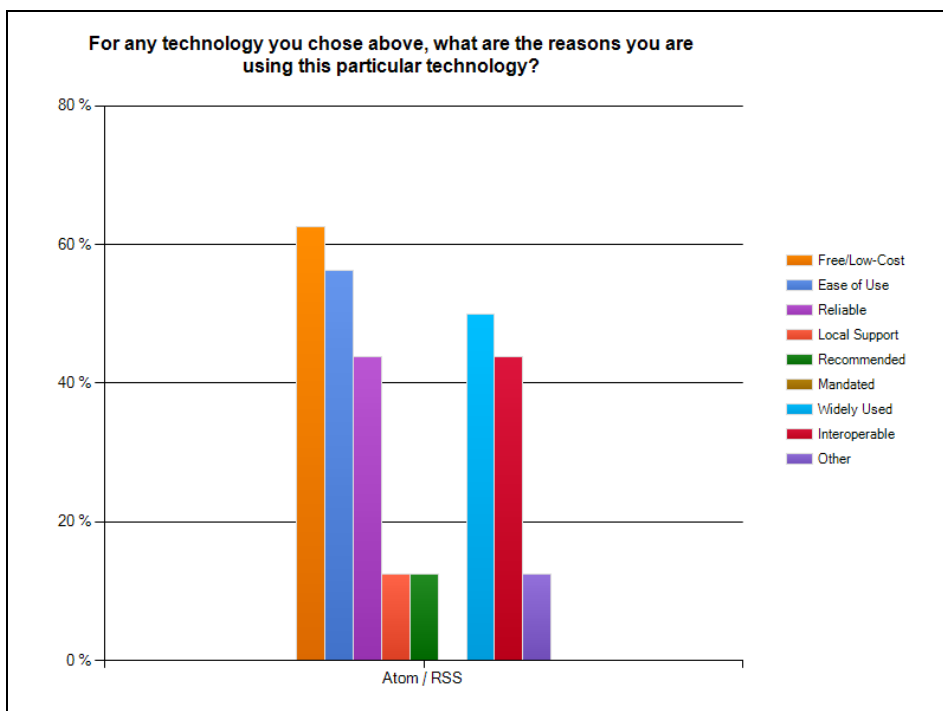
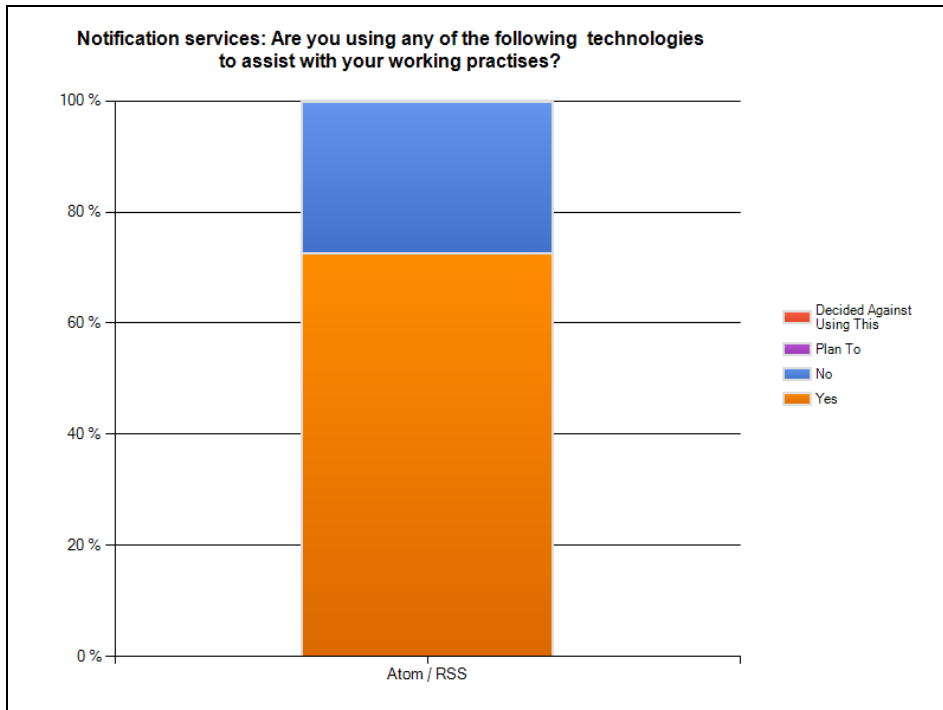
Second Life is the only virtual world software being used to any extent within the Australian HE sector. It has not been widely adopted because it is perceived as not being particularly realistic and being daunting for new users. It also requires downloading and it doesn't run in a browser window. However, users generally think that there may be a place for virtual worlds and also 3D gaming software in higher education in the future – particularly for training and simulation – as they improve in quality.

5.14 Calendars



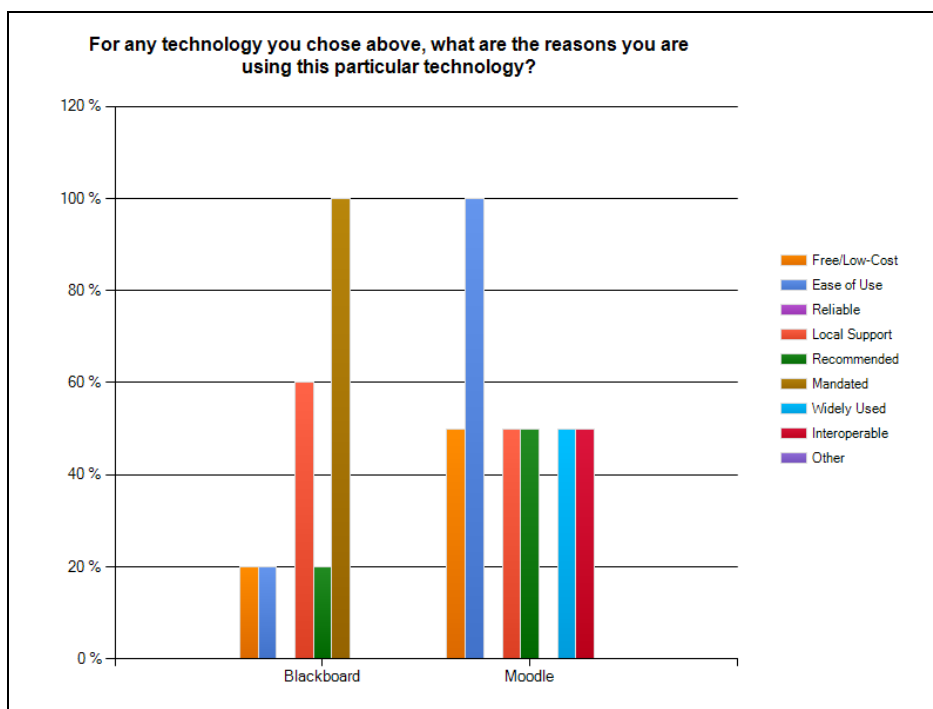
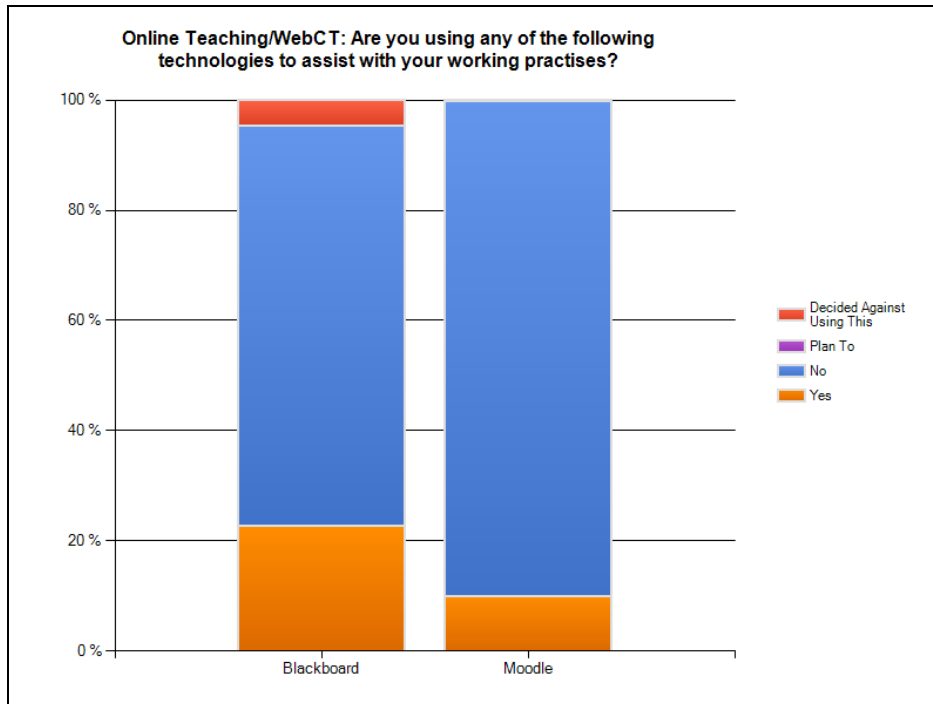
Doodle is an example of a Web 2.0 tool that has rapidly been adopted because of its ease-of-use and rapid dissemination through international groups trying to arrange meetings. It enables groups to schedule meetings without exchanging large numbers of emails.

5.15 Notification Services



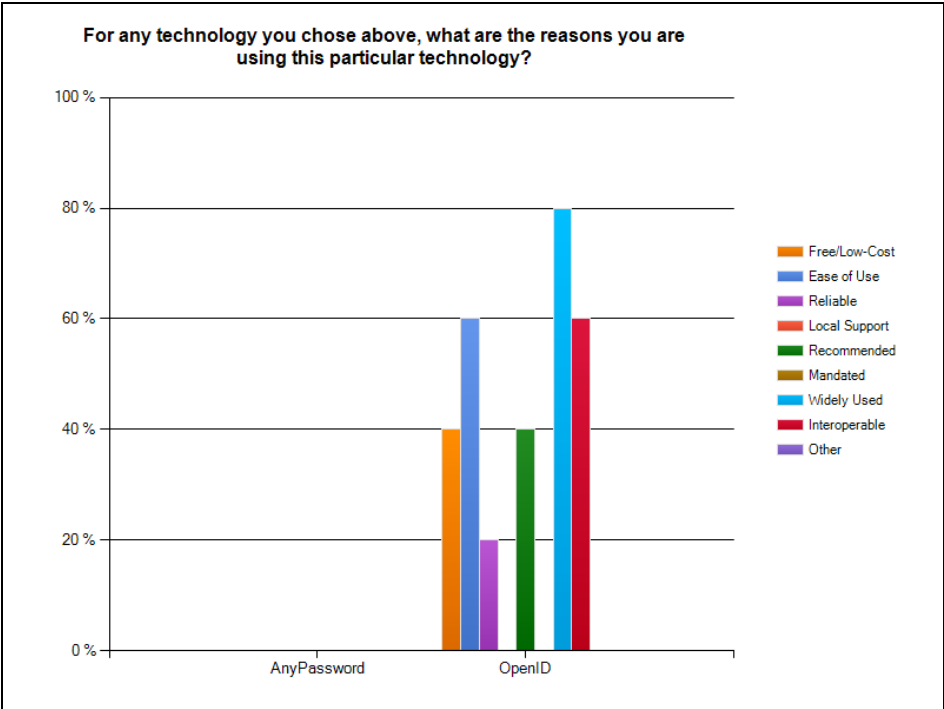
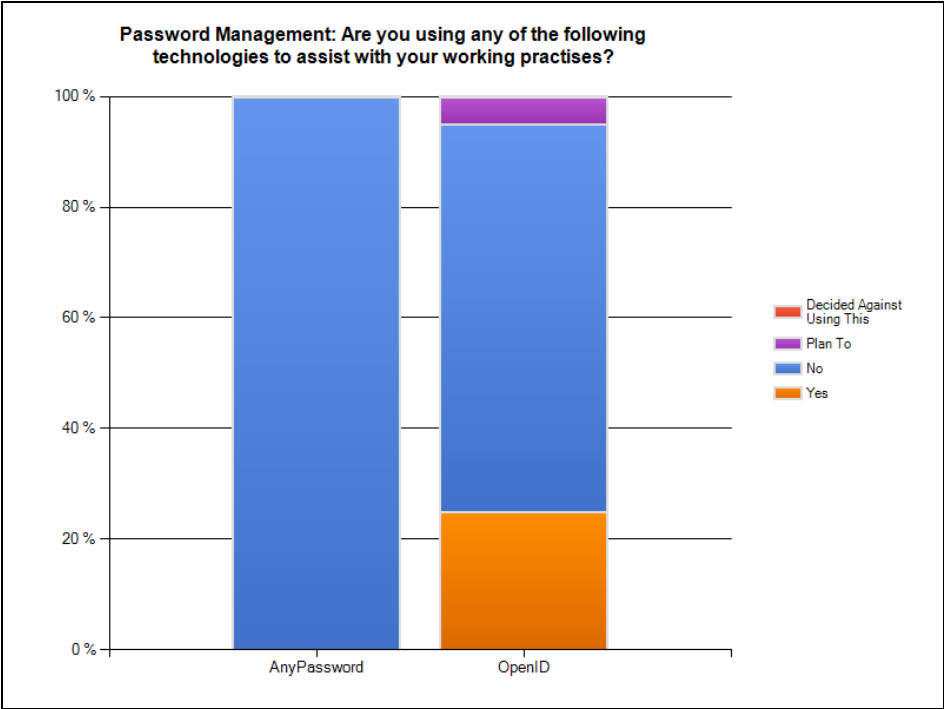
Many users have signed up to RSS feeds to stay in touch with and filter news items. However, rather than sign up to large numbers of such feeds, people are turning to aggregators (e.g. Google Reader, Google Chrome) to reduce incoming information to a manageable level. Google Reader was a popular choice for aggregating RSS feeds and blogs, because it is easy to set up and includes link sharing, recommended feeds based on existing selections, and usage statistics.

5.16 Online Teaching



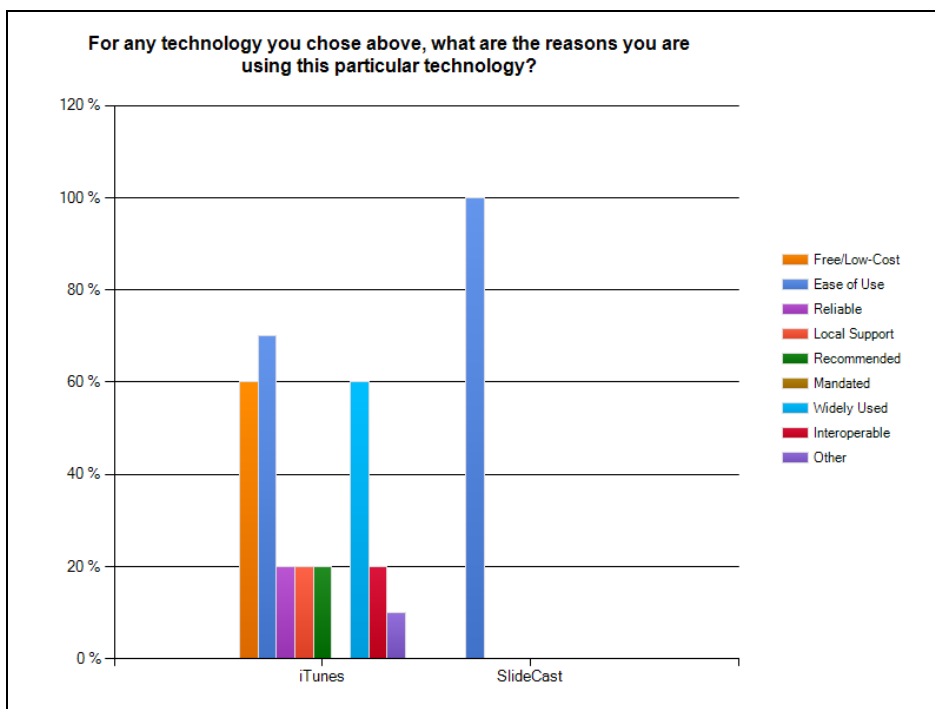
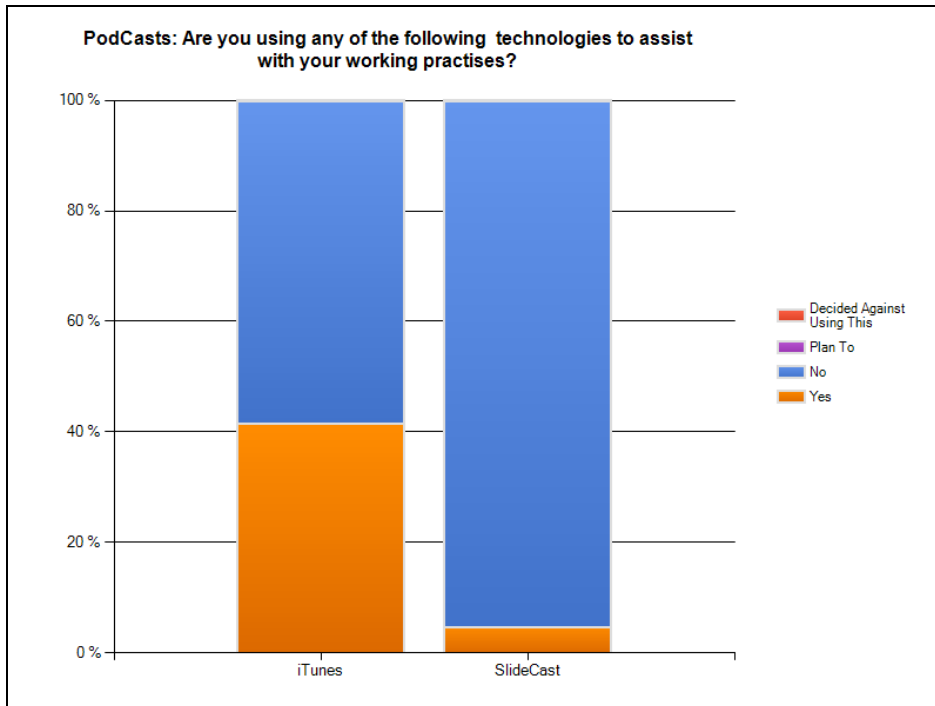
Blackboard is by far the most common approach being used to manage course material in Australian universities. The system allows faculty to post materials, deliver tests and surveys, hold online discussion and many other course-related functions. It is supported by IT services in most universities. The current version is Blackboard 9 or Blackboard Learn – “which brings with it a Web 2.0 style interface including drag & drop repositioning of content items on the Welcome page and the Course Menu.”

5.17 Password Management



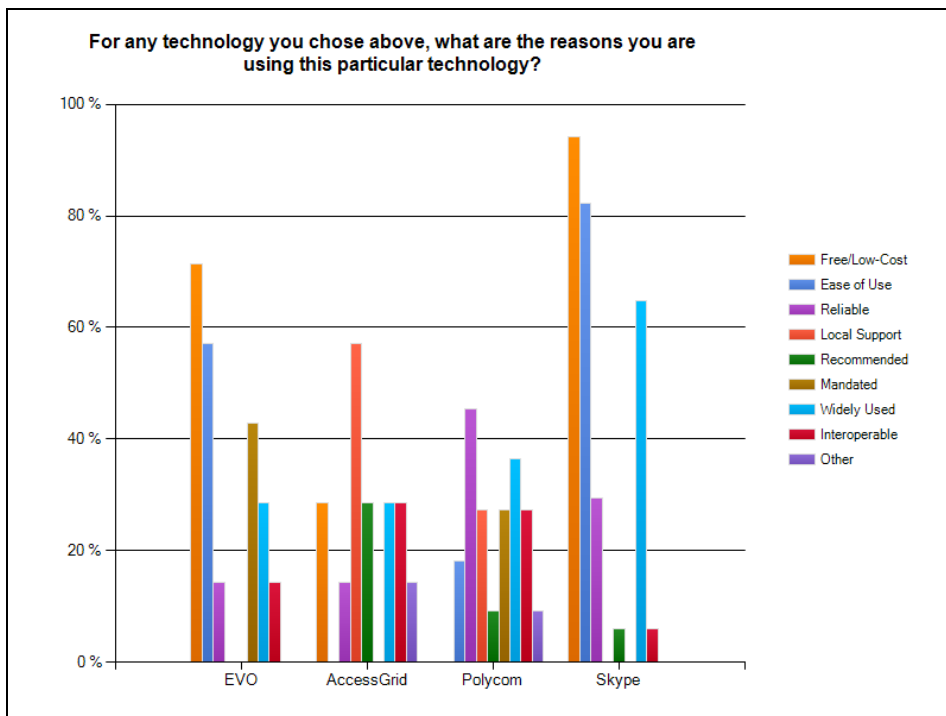
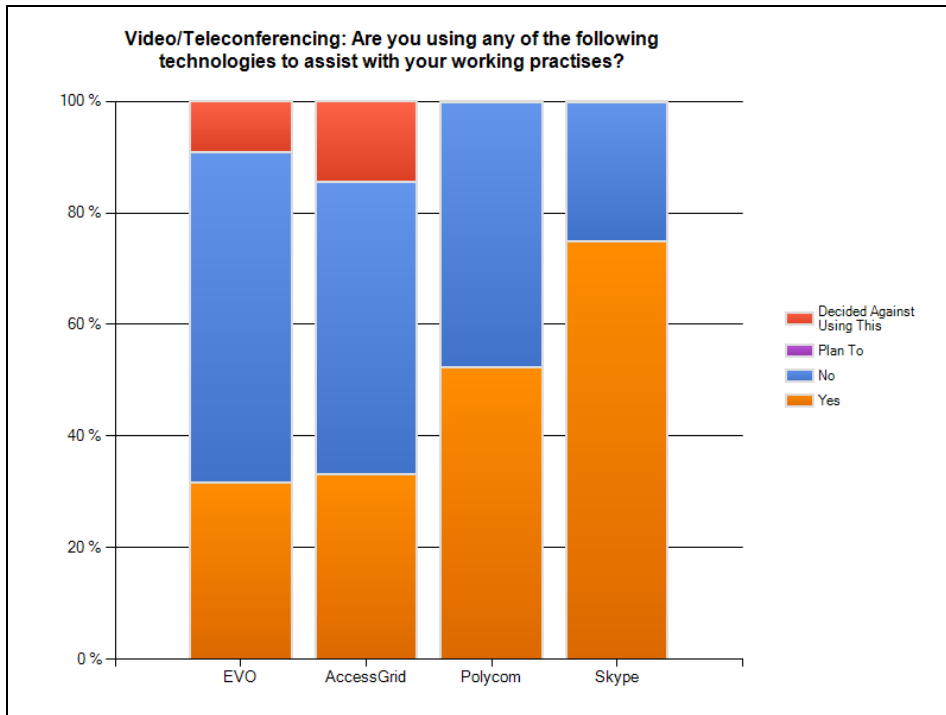
Australia has invested significant funding in establishing the Australian Access Federation (AAF) [6]. The AAF aims to provide authenticated secure access between participating institutions and service providers, based on Shibboleth. However the majority of users are using OpenID to manage their secure authenticated access to Web sites. This is a classic example of the tension between a rather heavy-weight solution designed specifically for the higher education sector versus a light-weight widely deployed Web approach.

5.18 Podcasts



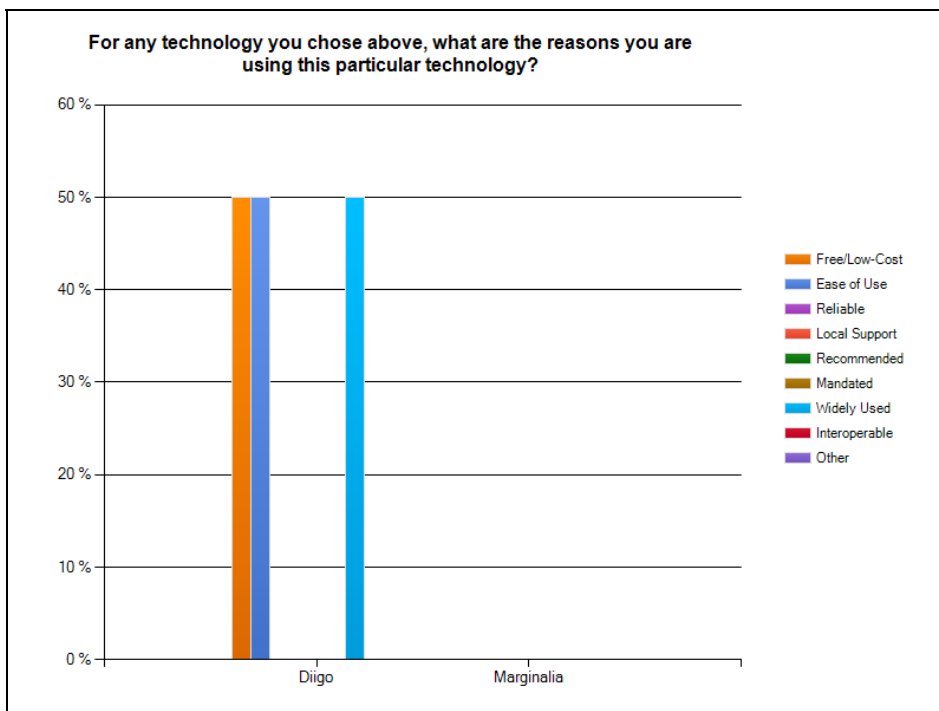
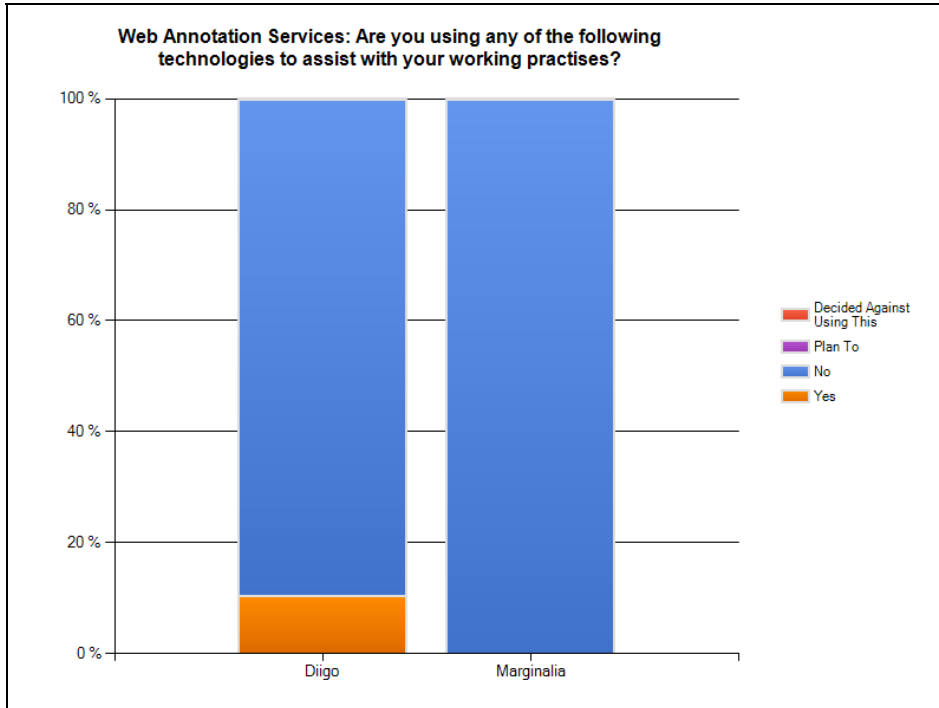
Podcasts are increasingly being used to record and broadcast lectures and speeches to subscribers via their iPods using iTunes. For example, the University of Queensland has a podcast site for distributing audio recordings of speeches and other events (<http://www.uq.edu.au/news/index.html?podcast=1>)

5.19 Video-conferencing



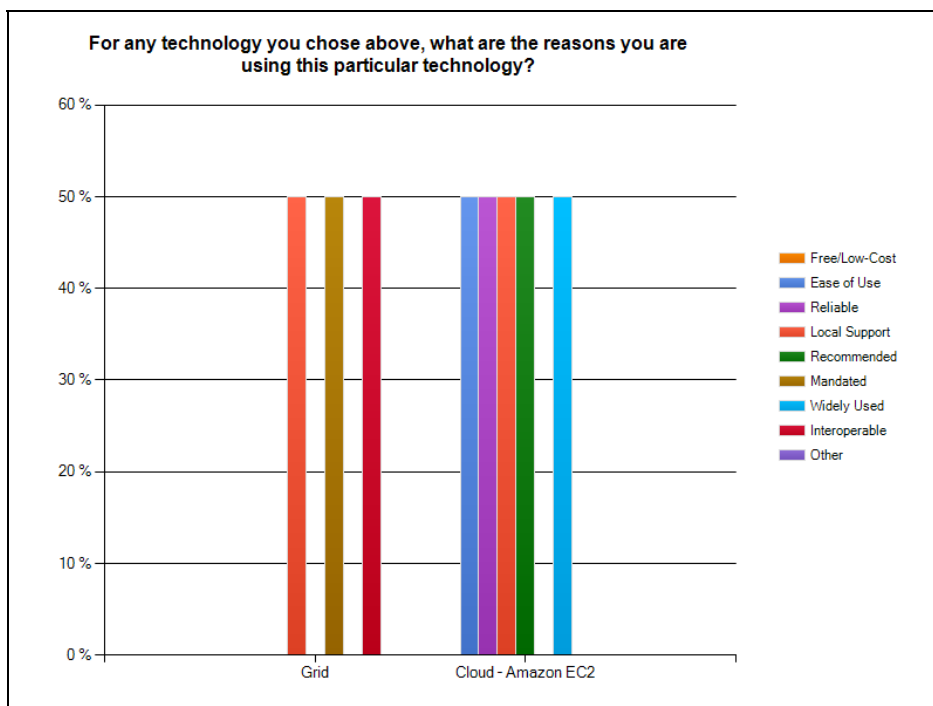
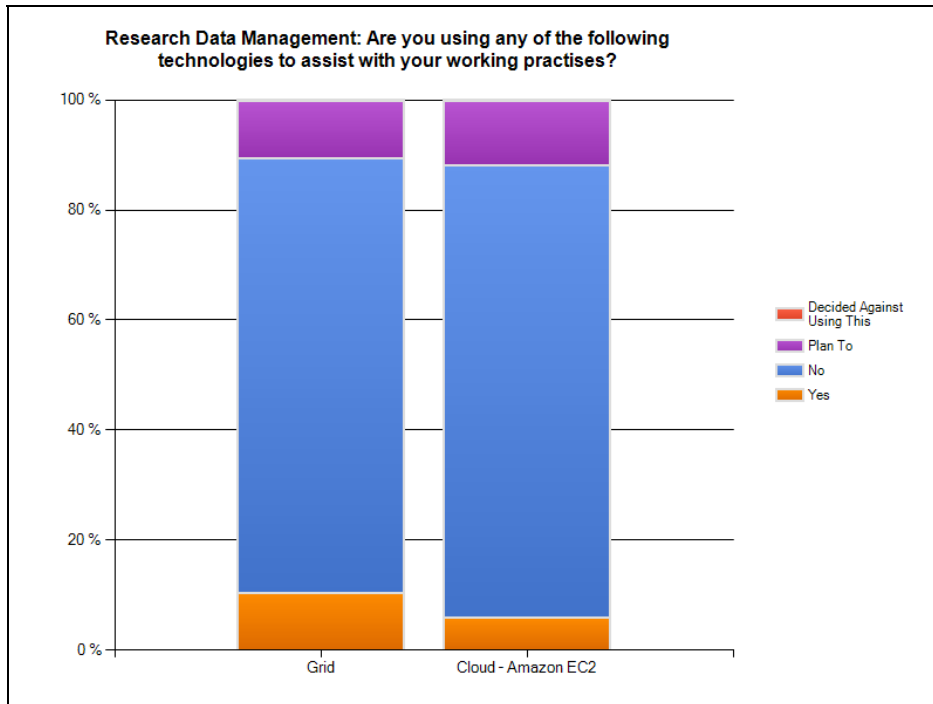
Most users have experience with Skype and would prefer to use this from their desktop, rather than Access Grid or EVO. Access Grids are perceived as becoming “white elephants”. EVO is increasingly being used by collaborative research groups – but mainly because it is mandated.

5.20 Web Annotations



Annotation services for web sites are not currently widely used. A small proportion of users are using Diigo – but social bookmarking tools like Delicious and Zotero are much more popular.

5.21 Grid/Cloud Computing



Using the cloud is increasingly appreciated by those who are members of more than one institution, or who use facilities or instruments across universities. Data storage on the cloud is also seen as very useful for storing both work-related and personal content. Unlike many institutional storage solutions, it is quickly and easily accessible.

6 Anticipated Future Trends and Recommendations

Web 2.0 technologies are changing the way that students, staff and institutional services in the Australian academic sector work and interact. Staff and students are embracing Web 2.0 technologies because they are so easy to download, install, experiment with and use – in order to quickly engage with colleagues and share the latest information. This has led to the gradual integration of Web 2.0 services into the academic digital infrastructure in Australia as universities recognize that they are not a passing fad and will be increasingly adopted.

The survey indicated that the number of Web 2.0 applications that staff/students access to perform daily tasks is continuing to rise and that the applications of choice change relatively frequently. This trend is having an impact on the role that academic IT service departments play. IT service departments are realizing that they can no longer control the applications that are being used for teaching, learning and research. Instead IT departments need to monitor user requests, web service usage and new web service developments. Institutions and staff also need easy ways to monitor the current service of choice in order to provide the relevant support and maximize engagement e.g., between lecturers and students, collaborators on research projects and between the university and its alumni. Universities and their IT departments need to be able to adapt to user demands, demonstrate flexibility, and provide support for multiple in-house and external services and applications.

Institutional IT departments need to evaluate different services and make recommendations. They need to identify when it makes sense to take advantage of services “in the cloud” such as Google Wave, rather than providing and mandating a local institutional or nationally-funded service that duplicates the freely-available and widely deployed service. Their role has changed from service development and service provision to one of providing technical support to people who need to engage with Web or cloud services - by setting up accounts, assisting with problems and recommending the best services.

However, these technologies are not perfect and they bring with them many challenges that need to be addressed. Consequently, there will still be a need for university IT service providers to identify gaps in user demand or security (or other) issues associated with Web 2.0 services - and focus on solutions and services to fill these gaps and solve associated problems. For example, users are having to remember increasing numbers of user ID/password combinations. Participants also expressed concerns around identity, anonymity and authority on Web 2.0 platforms. The issue of trust, confidentiality and reliability of information is a major issue in social networking, social bookmarking and social tagging sites that engage with strangers on the Internet. For these reasons, there is likely to be a demand for authenticated or closed social networking sites as well as secure wikis and blogs, that are hosted, maintained and authorized by institutions.

Federated identity management has also become a critical technology. This has become a significant challenge as applications move from the institution into the cloud. Although Australia has adopted Internet2's Shibboleth for the Australian Access Federation (AAF), there is pressure to also provide support for OpenID. Users are asking for systems that enable OpenID and Shibboleth/SAML 2.0 to work together (e.g., OpenID authentication combined with SAML 2.0 assertion exchange).

The survey also indicated that people's usage of Web 2.0 varies quite widely from the highly experienced early adopters to techno-phobic and mature staff particularly from non-technical disciplines. Although there is evidence to suggest that this gap is closing (even mature staff are beginning to use YouTube, blogs and wikis) – there will be a need for institutions to provide support, training and best practise guidelines on the use of the latest Web 2.0 technologies to ensure high levels of Internet and new media literacy across all staff and students.

Many staff and students are beginning to use storage in the “cloud” to store documents, photos, video and presentations. The attraction is because the content is quickly accessible, from any location, can be easily shared and still accessible even if they move to a different institution. Users stated that the advantages outweigh the recognized risk that content stored on externally hosted services may be lost if the service folds. Users try to mitigate this risk by choosing host services that are market leaders and hence less likely to fold.

Web 2.0 technologies are changing from being tools of choice by a few early adopters to being widely adopted by staff and students to enable collaboration and exchange of information. Universities need to start making proactive plans for how to apply these emerging technologies within organization-wide teaching, learning and research strategies.

Specific technologies of the future that need to be taken into consideration by higher education institutions include:

- Increasing demand for real-time information to be delivered to Internet-enabled mobile devices (e.g., i-Phones and i-Pods) via Twitter, FaceBook, FriendFeed, i-Tunes [11];
- GoogleWave – a crossover between instant messaging, email and a Wiki;
- Location-based services e.g., a photo taken on a mobile phone is instantly overlaid with information retrieved from the Web about the subject of the photo;
- Amateur content curation/indexing and recommendation services – the challenge will be enabling “crowd sourced” content to be aggregated with institutional content but distinguishable and filtered based on quality and trust;
- Cloud computing – data and applications that reside in “the cloud”. Expectations are that cloud computing will grow but that growth will be modest. Concerns about data security and institutional culture are expected to limit growth. Examples include:
 - The launch of “Office Web Apps” - free online versions of Word, Excel, PowerPoint and OneNote released in tandem with Microsoft Office 2010;
 - Google’s Chrome OS - a free, Web-centric operating system;
- Internet TV – the uptake of applications such as Hulu, Boxee, Apple TV and Netflix’s Roku box is expected to grow;
- Kindle – e-Book readers onto which hundreds of books can be cheaply downloaded, are rapidly being adopted in the US and Australia is expected to follow suit;
- Social gaming - Zynga’s FarmVille game on Facebook, Playfish. Real-time collaborative gaming on the internet is expected to advance into and be adapted for the higher education and academic sector – particularly for collaborative learning applications.

7 Author contact details

Jane Hunter
Director eResearch Lab,
School of ITEE
The University of Queensland
St Lucia, Qld, Australia

Ph 617 33651092
Mob 0402 395797
Email: j.hunter@uq.edu.au

8 References

- [1] The Australian National Data Service (ANDS)
<http://ands.org.au/>
- [2] ARCS Australian Research Collaboration Service
<http://www.arcs.org.au/>
- [3] NeAT National eResearch Architecture Taskforce Projects
<http://ands.org.au/neat-projects.html>
- [4] Platforms for Collaboration Investment Plan
<https://www.pfc.org.au/bin/view/Main/WebHome>
- [5] The Education Investment Fund
<http://www.innovation.gov.au/Section/AboutDIISR/FactSheets/Pages/EducationInvestmentFund.aspx>
- [6] Australian Access Federation (AAF)
<http://www.aaf.edu.au/>
- [7] ARCS Collaboration Services
<http://www.arcs.org.au/products-services/collaboration-services>
- [8] SWORD Atom Publishing Protocol Profile <http://www.swordapp.org/>
- [9] RoMEO Publisher Copyright Policies <http://www.sherpa.ac.uk/romeo/>
- [10] Goldstein, Philip J. *Alternative IT Sourcing Strategies: From the Campus to the Cloud* (Research Study, Vol. 5) (Boulder, CO: EDUCAUSE Center for Applied Research, 2009), available from <http://www.educause.edu/ecar>.
- [11] Alan Livingstone, "The Revolution No One Noticed: Mobile Phones and Multimobile services in Higher Education", *EDUCAUSE Quarterly* 32, No 1 (2009).