Education and Health Standing Committee

The role of ICT in Western Australian Education: Living and Working in a Digital World

Report No. 16
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Education and Health Standing Committee

The role of ICT in Western Australian Education: Living and Working in a Digital World

Report No. 16

Presented by

Dr Janet Woollard MLA

Laid on the Table of the Legislative Assembly on 27 September 2012

Chair's Foreword

This Report is the fifth Report of the Committee's *Inquiry into Improving Educational Outcomes for Western Australians of All Ages*. This Report reviews the Department of Education's (the Department) vision for information communications technology (ICT) and its role in education in Western Australia. It does so in the context of a rapidly increasing rate of technological change that is affecting the infrastructure and the pedagogy of education.

The Committee is pleased to acknowledge the way in which the Department has captured the implications of these changes to best advantage the schools, the teachers and the students, within the constraints of a limited ICT budget. I would like to thank the Director General and her staff in the Department for the open and transparent way in which they responded to the information needs of the Committee.

Locally and internationally, information and communications technology is taking a pivotal role in education and teaching. Whereas technology was once seen only as a way to teach computer literacy, there is now a broad recognition that ICT can deliver many types of learning at a lower cost. Rapid advances in ICT devices and the widespread adoption of ICT mean that they are increasingly able to support:

- competency and performance-based curricula;
- learning environments centred on problem-centred and inquiry-based activities; and
- student-based learning.

Additionally, the advent of Cloud Computing has seen the Department develop and extend its web-based applications through a private Cloud. This has enabled significant cost savings in terms of infrastructure and allows individuals to access data from wherever they happen to be at the time.

The empowering nature of these developments has been met by the Department's great flexibility in the use and application of technology in schools. To its credit, the Department's philosophy is that 'it's not about the technology as much as it is about the teacher' and in terms of the teacher 'it is the school leadership and management that makes the biggest difference and that is not something that is best bureaucratised.' [1]

1 Mr Lindsay Hale, Acting Executive Director, Statewide Planning and Delivery, Department of Education, *Transcript of Evidence*, 21 March 2012, p9.

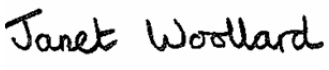
However, there are three areas which are highlighted in this Report that require attention, namely:

- The need for additional funds to complete the roll out of the Department's standard operating environment (SOE4). There is a strong case to be made that the cost of completion of the rollout would be recouped in the medium term through savings achieved in reduced need for infrastructure replacement, and lower support requirements.

- There is a hotly contested issue of the level of ICT support required in both primary and secondary schools. After three years this has not been resolved.

- There is an identified need for mandated professional learning that integrates the use of ICT in the classroom into the curriculum and aligns its use with a teacher's pedagogy and experience.

I would like to thank my fellow committee members Peter Watson MLA (Deputy Chair), Dr Graham Jacobs MLA, Peter Abetz MLA and Lisa Baker MLA for their collective contributions to this Report. I would also like to thank very much Dr Brian Gordon, our Principal Research Officer and Lucy Roberts who worked hard in the compilation of this Report and in the sourcing and analysing of the research evidence. Your enthusiasm is greatly appreciated.



DR JANET WOOLLARD MLA
CHAIR

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Executive Summary

Technology has played a part in education for the past seventy years. However, its role has been largely confined to assisting students perform technical or mathematical calculations more effectively, facilitating note taking or supplementing a curriculum that is based on textbooks. Information communications technology, in contrast, is a game changer. It can deliver content instantly, bring distant individuals together, and make administrative processes faster. As such it is a catalyst for change when integrated into the education system. 'It engages learners in challenging, open-ended activities in which they have control over the pace and direction of their learning.'[2] The paradigm shift is from the teacher as the 'deliverer' of knowledge to a new, open learning environment focused on the learner as the information seeker.

As is noted in this Report, research shows that classes with online learning, whether completely online or blended, on average produce stronger learning outcomes than learning face-to-face alone. Unsurprisingly, a school's level of 'e-maturity' is shown to have a strong positive relationship to the perceived use and effect of information communications technology (ICT) on both teaching and learning.

The Department of Education (the Department) has a vision for ICT. That vision would see that all schools, regardless of their physical location, should have access to reliable, secure, easy-to-use tools to cater for their individual students' learning needs. Embedded in this vision is the view that learning will flourish if both student and teacher needs are at the core of system design, development and delivery.

The Department is implementing an empowering, decentralised model of ICT deployment and support. Using web-based, private Cloud technology, it is driving its costs down while increasing the efficiency and effectiveness of its ICT. It is doing this through the progressive roll out of its 'Standard Operating Environment 4', (SOE4) which has won a national award for innovation. However, as outlined in this Report, the Committee finds that the Department is significantly hampered in its efforts by tight budgetary constraints. This has significantly limited the rollout of SOE4, together with the adequate provision of ICT support in schools, and the effective provision of ICT professional development.

At both Federal and state levels, the importance of education to the future of this country and state is acknowledged. There is perhaps less recognition, and

2 University of Education, Winneba, Ghana, *Learning in a Digital World: The Role of Technology as a Catalyst for Change, Available at* www.neiu.edu/~ncaftori/sandy.doc, Accessed on 3 September 2012.

consequential funding, for the fact that ICT in education is the tool for learning in the 21st century; one that will create the workforce for our digital world.

Ministerial Response

In accordance with Standing Order 277(1) of the Standing Orders of the Legislative Assembly, the Education and Health Standing Committee directs that the Premier, the Treasurer, and the Minister for Education report to the Assembly as to the action, if any, proposed to be taken by the Government with respect to the recommendations of the Committee.

Findings and Recommendations

Finding 7 **Page 24**

The Department of Education allows flexibility in the use and application of technology. Its philosophy is that 'it's not about the technology as much as it is about the teacher' and in terms of the teacher 'it is the school leadership and management that makes the biggest difference and that is not something that is best bureaucratised.'

Finding 8 **Page 28**

With the adoption of SOE4 the Education Department is moving towards a private Cloud deployment model. It is also investigating public Cloud Computing, using Microsoft Office 365. This will allow students to store their school material as well as their emails. The Department is, therefore, migrating cautiously to a hybrid Cloud deployment model which is comprised of its private Cloud system and a public Cloud system offered by Microsoft.

Finding 9 **Page 29**

Using private or public Cloud based deployment models, an individual school's output can be maintained with less technology input, freeing up teacher and ICT technicians' time while reducing costs. The business case for Cloud lies in its ability to provide capacity-efficient layers of IT while reducing costs.

Finding 10 **Page 32**

While the Department provides a high standard of service through its ICT Customer Service Centre, schools without SOE4 cannot be accessed remotely by the ICT Customer Service Centre, impeding an effective response.

Finding 11 **Page 36**

There is broad acknowledgement that the lack and quality of ICT support in the schools is an issue. The level of ICT support staff can vary across schools; typically primary schools have no ICT Officers, metropolitan high schools have varying levels of ICT Officers employed, and regional and remote schools can have no ICT Officers. It is anecdotally reported that 'a lot of equipment is not fixed'.

Finding 12 **Page 40**

In some regions, competition for skills with the mineral resources sector further exacerbates the difficulties in getting ICT repair and support.

Finding 13 **Page 44**

The issue of the provision of ICT support has been in and out of the Industrial Relations Commission for three years without resolution. An alliance of six major stakeholders has now been formed to try to secure additional funding from the government to address:

- Funding for ICT systems and infrastructure;
- Funding for ICT support staff at 1FTE per 200 computers, with a shared resource for schools with less than 200 computers; and
- Funding to provide training for IT officers and other school staff.

Recommendation 2 **Page 44**

The Committee recommends to the Minister for Education that additional funding be provided in the 2013 budget for ICT support staff to schools at 1FTE per 200 computers, with a shared resource for schools with less than 200 computers.

Recommendation 3 **Page 45**

The Committee recommends to the Minister for Education that additional funding be provided in the 2014 budget to facilitate a bi-annual independent assessment of FTE ICT staff required in state schools.

Finding 14 **Page 60**

The greater the skill of the teacher in combining technology with their teaching and learning program the greater the result in better educational outcomes for their students. This includes literacy.

Finding 15 **Page 63**

The potential of ICT will not be realised where a school is equipped with new technology unless the teachers are trained in how to use it, as part of their approach to student learning. There is currently no coherent mandated strategy to achieve this.

Recommendation 4 **Page 63**

The Committee recommends to the Minister for Education that by 2014 the Education Department mandate ICT as part of continuing professional development. ICT should be integrated into the classroom curriculum and aligned with the teacher's approach to student learning.

Finding 16 **Page 78**

Learning Analytics will play an increasingly important role in improving student educational outcomes, as online learning becomes a normalised part of the education process. Currently, Learning Analytics usage is hampered by unfamiliarity and poor data tabulation.

Recommendation 5 **Page 78**

The Committee recommends that the Minister direct the Department of Education to investigate and report back to the Minister by December 2013 on the use and application of student learning analytics to assist teachers and students.

Chapter 1

A short history of technology in education

'It's not the capital assets – it's about the teaching'[3]

The evolution of applied technology

> *Books will soon be obsolete in schools … Our school system will be completely changed in the next 10 years. Scholars will soon be instructed through the eye. ~ Thomas Edison on the evolution of the motion picture, 1913*

The application of technology to education is not new. Beginning in the 1900s there has been a steadily increasing use of technology in education. In its many forms technology has been used to facilitate learning processes and increase the performance of the educational system(s). This chapter highlights some of the key milestones of the journey of the last sixty years, by way of a background to the Report.

c. 1940 – Mimeograph
Surviving into the Xerox age, the mimeograph made copies by being hand-cranked.

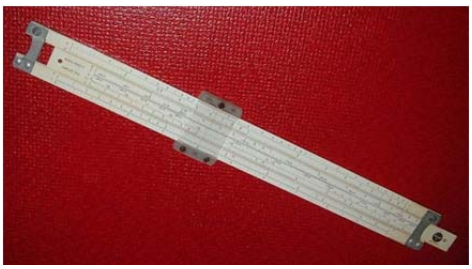
c. 1950 – Headphones
Thanks to theories that students could learn lessons through repeated drills and repetition (and repeated repetition) schools began to install listening stations that used headphones and audio tapes. Most were used in what were dubbed 'language labs' and this practice is still in use today, except now computers are used instead of audio tapes.[4]

3 Briefing by the Centre for Educational Innovation and Technology (CEIT), University of Queensland, Brisbane, 5 July 2012.

4 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.

c. 1950 – Slide Rule

William Oughtred and others developed the slide rule in the 17th century based on the emerging work on logarithms by John Napier. Before the advent of the pocket calculator, it was the most commonly used calculation tool in science and engineering. The use of slide rules continued to grow through the 1950s and 1960s even as digital computing devices were being gradually introduced; but around 1974 the electronic scientific calculator made it largely obsolete and most suppliers left the business. [5]



1951 – 2012 Videotapes

A videotape is a recording of images and sounds on to magnetic tape as opposed to film stock or random access digital media. Videotape is used in both video tape recorders (VTRs) or, more commonly and more recently, videocassette recorders (VCR) and camcorders.

Tape is a linear method of storing information and, since nearly all video recordings made nowadays are digital direct to disk recording, it is losing importance as non-linear/random-access methods of storing digital video data become common.[6]

5 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.

6 Wikipedia, *Videotapes*, Available at: http://en.wikipedia.org/wiki/Videotape. Accessed on 15 June 2012.

1957 – Skinner Teaching Machine

B. F. Skinner, a behavioral scientist, developed a series of devices that allowed a student to proceed at his or her own pace through a regimented program of instruction with feedback. [7]

c. 1958 – Educational Television

Television was introduced into Australia in September 1956 and three years later the Headmasters Conference of Australia asked the newly formed Australian College of Education (ACE – now known as the Australian College of Educators) 'to provide a report on and suggestions for the use of television in schools, including using closed circuit television.'[8] The advent of television saw its use in a range of educational settings including:

- art, music, science, vocational trades, teen-age matters, social studies, health, arithmetic, reading, and language arts - practically every subject in the primary and secondary curriculum;
- distance learning; and
- the transmission of classroom lectures to other locations on university campuses.

1959 – Photocopier

Xerographic office photocopying was introduced by Xerox in 1959, and it gradually replaced copies made by Verifax, Photostat, carbon paper, mimeograph machines, and other duplicating machines. There have been many predictions that photocopiers will eventually become obsolete as information workers continue to increase their digital document creation and

7 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.

8 Australian College of Educators, *Early Initiatives of the Australian College of Educators - Investigating Educational Television 1959-1964*, 2010, p1. Available at: http://austcolled.com.au/sites/default/files/Brief_no._11_Dec10.pdf. Accessed on 15 June 2012.

distribution, and rely less on distributing actual pieces of paper.[9]
Today, photocopying is used throughout the world in business, education, and government.

1965 – Filmstrip Viewer
A precursor to the iPad perhaps, this filmstrip viewer is a simple way to allow individual students watch filmstrips at their own pace.

c. 1970 – The Hand-Held Calculator & in 2012
The predecessor of the much-loved and much-used TI-83, this calculator paved the way for the calculators used today. However, there were initial concerns as teachers were slow to adopt them for fear they would undermine the learning of basic skills. [10] In reality, early hand-held calculators began to change methods of instruction. They freed up enormous amounts of class time by eliminating the teaching of interpolation of tables, the algorithm for finding square roots, and other such skills. Teachers became more willing to try more complicated problems since the calculations were easy to perform.[11]

1972 – Scantron
The Scantron Corporation removed the need for grading multiple-choice exams. Scantron machine automatically graded multiple choice tests.

9 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.
10 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.
11 Clutter, M, ' Graphing Calculators: The Newest Revolution in Mathematics', *Inquiry, Volume 4, Number 1, Spring 1999, 10-12*.

1980 – Plato Computer

Programmed Logic for Automatic Teaching Operation (PLATO) was developed out of research into the possibility of using computers for teaching. By 1984 public schools in the U.S. averaged about one computer for every 92 students. The Plato was one of the most-used early computers to gain a foothold in the education market.[12]

1985 – 2012 CD-ROM Drive

Compact Disc Read Only Memory (CD-ROM) refers to a technology in which a range of data types, such as text, graphics, audio, photographs, and video can all be stored in digital form and accessed by conventional Personal Computers.[13]

A single CD could store an entire encyclopedia plus video and audio. The CD-ROM and eventually the CD-RW paved the way for flash drives and easy personal storage.

The CD-ROM enables access to low cost educational and homeschool software with a plethora of interactive computer-based activities for pupils. It is generally used as an interactive educational medium. For instance, programs have been developed for students to improve their phonic skills in order to reinforce their spelling skills.

12 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.

13 Footscray Institute of Technology, *Using CD-ROM and multimedia for education and training*, Available at: http://www.ascilite.org.au/aset-archives/confs/edtech90/shaw.html. Accessed on 15 June 2012.

1985 – Hand-Held Graphing Calculator

The successor to the hand-held calculator (see above), the graphing calculator made far more advanced math, such as algebra, much easier as it enabled the plotting out of points and long equations. They are capable of plotting graphs, solving simultaneous equations, and performing numerous other tasks with variables. The 1990s saw the graphing calculator become much more powerful, culminating in 1997 with the TI-92 virtually a hand-held computer. [14]

1990 -2012 The PC then and now

The advent of the era of the personal computer was acknowledged by Time magazine in 1982, when they broke with tradition by choosing the PC as their "Man of the Year." By the late 1980s, technology advances made it feasible to build a small computer that an individual could own and use.[15]

In schools there has been a rapid expansion in the use of PCs, laptops and notebooks for a growing number of applications including:

- Research;
- Educational software;
- Artistic expression;
- Web design;
- Writing papers; and
- Testing.

c. 1999 – Interactive Whiteboard

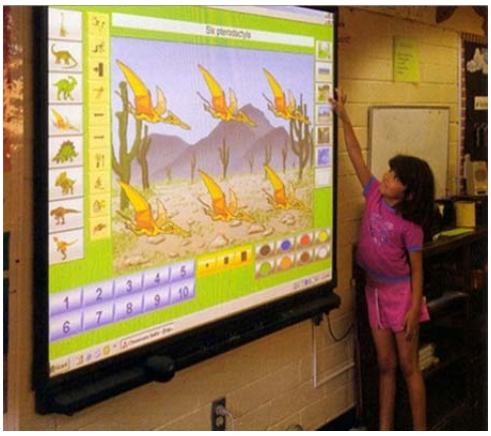
The chalkboard got a facelift with the whiteboard. That got turned into a more interactive system that uses a touch-sensitive white screen, a projector, and a computer. As schools move progressively into a digital learning environment, these interactive whiteboards are being widely adopted in primary and secondary

14 Clutter, M, ' Graphing Calculators: The Newest Revolution in Mathematics', *Inquiry, Volume 4, Number 1, Spring 1999, 10-12*.

15 Tools of Computer, *Personal Computer*, Available at: http://tipstools.blogspot.com.au/2010/11/personal-computers.html. Accessed on 14 June 2012.

classrooms.

Connected physically to a computer and a projector by a USB cable, or wirelessly using technology such as Bluetooth, the whiteboard display typically emulates the computer mouse and keyboard and is operated by using a special pen, or finger touch, depending on the model. Either front or rear projection models can be used and software is available to support all learning areas.[16]



Interactive whiteboards (IWBs) are seen as easy-entry technologies because they fit with many teachers' current practices. The evaluation of the United Kingdom's Primary School Whiteboard Expansion project found that:

The length of time students were taught with IWBs was a major factor in student attainment across core subjects at Key Stage 2. There were positive impacts on literacy and mathematics at Key Stages 1 and 2 once teachers had experienced sustained use and the technology had become embedded in pedagogical practice.[17]

2005 – iClicker

There are many similar tools available now, but iClicker was one of the first to allow teachers to be able to quickly poll students and get results in real time. An iClicker is a radio frequency device that allows a student to anonymously respond to questions the educator poses in class.[18] It is claimed that it increases interaction and student feedback.

16 Department of Education, *Interactive Whiteboards* 2012, Available at: http://www.det.wa.edu.au/education/cmis/eval/curriculum/ict/iwb/index.htm. Accessed on 15 June 2012.

17 UK Department of Education - BECTA, The impact of digital technology, 27 Augusts 2012, Available at: http://www.ictliteracy.info/rf.pdf/impact-digital-tech.pdf. Accessed on 27 August 2012.

18 Media Services, *iClicker information*, 2012 Available at: http://www.cis.hawaii.edu/guc/ars/student.html. Accessed on 15 June 2012.

2006 – XO Laptop

The 'One Laptop per Child' computer was built to be durable and cheap enough to sell or donate to developing countries. 'It's an incredible machine that works well in sunlight, is waterproof, and much more.' [19]

Figure: Aboriginal student with XO laptop.[21]

In Australia this means helping children in remote communities cross the 'digital divide' by giving them laptops that are not only fully loaded with educational and entertaining programs to help them learn, but that can also be connected to the Internet so they can share their experiences with the rest of the world and, likewise, learn from others.[20]

2010 – Apple iPad

The iPad is being trialed in a large number of schools and educational settings across Australia. A theme page provides links to school trials, app review sites, and blogs by teachers using iPads and a range of other useful resources for iPads in and out of the classroom.[22] Could the iPad bring Thomas Edison's statement to life? Could the iPad make it so 'scholars will soon be instructed through the eye.' Only time will tell.[23]

19 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.

20 Computerworld, *OLPC boosts outback education with laptop deployment*, Available at: http://www.computerworld.com.au/article/304648/olpc_boosts_outback_education_laptop_deployment/#closeme. Accessed on 15 June 2012.

21 Photo credit: One Laptop Per Child (OLPC) Australia

22 Schools.edna.edu.au, *iPads in education*, Available at: http://apps-new.edna.edu.au/edna_retired/edna/go/schooled/school_theme_pages/ipads.html. Accessed on 15 June 2012.

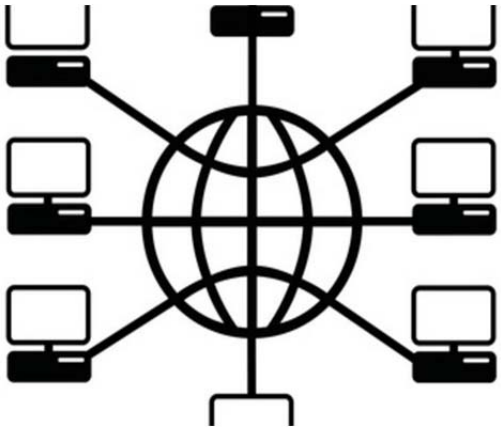
23 Dunn, J., *The evolution of classroom technology*, Available at: http://edudemic.com/2011/04/classroom-technology/. Accessed on 14 June 2012.

Network operating systems

A network operating system (NOS) is a software program that controls other software and hardware that runs on a network of two or more computers. It allows multiple computers, known as network computers, to communicate with one main computer and each other, so as to share resources, run applications, and send messages, among other things. It interfaces with the standard operating environment (SOE). The SOE standardises the hardware and software platforms used within an organisation.

A computer network can consist of a wireless network, local area network (LAN), a wide area network (WAN), or even two or three computer networks. The heart of any of these networks, however, is the network operating system.[24]

Figure 1.1 Network operating system[25]



Each school in Western Australia has a Network operating system whether it is LAN or increasingly WAN and traditionally this has included the servers, desktops, applications, and other IT infrastructure, such as printers.

However, as this report highlights, the nature of Department of Education's systems are rapidly evolving with significant implications for administrators, students, teachers and operating costs into the future.

24 WiseGEEK, *What is a network operating system*, Available at: http://www.wisegeek.com/what-is-a-network-operating-system.htm. Accessed on 14 June 2012.

25 Aquino, J., *History of Network Operating Systems*, Available at: http://www.ehow.com/about_7230368_history-network-operating-systems.html. Accessed on 14 June 2012.

Chapter 2

ICT in the Education Department of WA in 2012

'I' before 'E' – infrastructure before e-learning

The importance of ICT in schools

Locally and internationally, information and communications technology (ICT) is taking a pivotal role in education and teaching. Whereas technology was once seen as a way to teach computer literacy, there is now a broad recognition that ICT can deliver many types of learning at a lower cost.

Rapid advances in ICT devices and the widespread adoption of ICT mean that they are increasingly able to support:

- competency and performance-based curricula;
- learning environments centred on problem-centred and inquiry-based activities; and
- student-based learning.

These advances led the Chief Information Officer for the Department of Education to note, 'technology should be mainstream in today's schooling.'[26]

In Victoria, the Department of Education and Early Childhood Development's (DEECD) 2011–12 Asset Strategy reinforces ICT's central role for Victorian schools by stating that 'seamless access to ICT is increasingly essential for effective teaching and learning practice'.[27]

Views such as these underpin the Federal government's initiative 'The Digital Education Revolution' which aims to 'contribute sustainable and meaningful change to teaching and learning in Australian schools to prepare students for further education and training and for living and working in a digital world.' [28]

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26 Briefing by Mr Bevan Doyle, Chief Information Officer, Department of Education, 13 August 2012.

27 Auditor-General (Victoria), *Obsolescence of Frontline ICT: Police and Schools*, 2012, Available at: http://www.audit.vic.gov.au/publications/20120620-ICT-Obsolescence/20120620-ICT-Obsolescence.html. Accessed on 5 September 2012.

28 Department of Education, Employment and Workplace Relations, *Experience The Digital Education Revolution* 2012, Available at: http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/Resources/guide/AbouttheGuide/Pages/ICTandschooleducation.aspx. Accessed on 20 August 2012.

Chapter 2 ICT in the Education Department of WA in 2012

Spanning an area of 2.5 million square kilometres, the Department of Education (the Department) in Western Australia has one of the largest operating networks in Australia that reaches across the state to connect all schools with up to 10-megabit per second telecommunication services. In addition to fibre optics, schools are connected through '36 satellite sites and about 170-odd [sites] that are still copper'.[29] It is in this context that the Department has developed its ICT strategy.

> *The Department of Education is [trying] to maximise the value of education in terms of technologies in the classroom. It is a very big and complex organisation technically. There are 150 000 computers on our network. It is a very large and complex technical environment. We run email systems and collaboration tools. There are up to a billion emails a year that we get through our gateway. We deliver to schools services such as the internet, where you will get about 30 terabytes of data per month being delivered to schools.*[30]

It is the Department's vision that all schools, regardless of their physical location, should have access to reliable, secure, easy to-use tools to cater for their individual students' learning needs. Embedded in this vision is the view that:

> *Learning will flourish if student and teacher needs are at the core of system design, development and delivery. e-Learning programs have the potential to deliver improved services and tools for schools coupled with quality professional support.* [31]

Finding 1

The changing role of information communication technology in schools has seen a move away from using ICT for computer literacy, to an acceptance that ICT can deliver many types of learning at a lower cost.

The approach taken by the Department is a combination of top down and bottom up. Schools are encouraged to adopt and use technology in innovative ways. The experience of schools is then incorporated by the 'centre', or head office as it 'strategises for the whole system'. The schools' contextual use of technology is seen as reflective of the best way it can be applied on the ground.[32] The

29 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p4.
30 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p2.
31 Submission No. 15 from Department of Education, November 2011, p2.
32 Ms Deborah Bevan, Manager e-Schooling, Department of Education, *Transcript of Evidence*, 21 March 2012, p13.

Department has consciously embarked on an empowering, decentralised model in ICT deployment and support. This matches the nature of ICT which can empower students to purposefully select activities, applications and modes of communication. It can similarly empower teachers to develop student-centred, active and interactive learning while connecting with their expectations, experiences and needs. In addition, as outlined in chapter-five, ICT can support dynamic relationships between students, parents and the school.

The objectives of the rollout of ICT across the education sector in Western Australia are twofold:

1. to improve the effectiveness and impact of online learning systems; and
2. to improve the quality and flow of information to and from schools. [33]

However, despite the Department's significant investment in technical infrastructure and ICT systems, the return on this investment has been mixed. Although significant improvements in student information, digital resource access, reporting and interschool communication have been achieved, there has been:

> *Less than expected uptake and retention of technologically-enhanced teaching and learning approaches. Recent evidence from teachers shows the current user experience is disjointed.*[34]

Finding 2

There has been a significant investment in information and communications technology by the Department of Education. This has resulted in significant improvements in student information, digital resource access, reporting and interschool communication. However, there is less than expected uptake and retention of technologically-enhanced teaching and learning approaches.

I before E – infrastructure before e-learning

In today's ubiquitously connected world, information systems and computer technology are virtually inseparable from telecommunications. The Education Department's information systems are distributed locally or geographically and it is telecommunications technology that unifies them in a networked environment. This environment is one of the more complex aspects of IT infrastructure and the escalating dependence on it places schools, teachers and the Department itself at increasing risk when faced with poor connectivity, outages, or other failures.

33 Submission No. 15 from Department of Education, November 2011, p2.
34 Submission No. 15 from Department of Education, November 2011, p2.

Nonetheless, without the appropriate information communication technology infrastructure the Department's vision for education into the future fails. Therefore, the Department has a clear priority on putting in place the ICT infrastructure in all schools to optimise e-learning and improve administrative and processes and pedagogy. This includes:

- **Broadband** - all schools require improved bandwidth services to cater for the increased uptake of online services.
- **Core Central Network** - required to deliver videoconferencing services to schools.
- **School Standard Operating Environment** (SOE) - to enable consistent and reliable service delivery to all schools. The Department is currently implementing the SOE, as outlined below, to deliver the Digital Education Revolution to students in Years 9-12. A state-wide deployment of a SOE will enhance the Department's capacity to deliver its services in metropolitan, regional and remote settings through one coordinated network.
- **Video Conferencing** - to support delivery of learning across school sites. The Great Southern Local Schools Working Together Partnership highlights that, with access to the right technology, schools are able to deliver innovative programs to meet individual students' needs, regardless of their location. The six senior high schools in this partnership have created an online classroom environment to offer subjects that each school on their own could not offer due to limited numbers.
- **Technical Support** - to maintain a quality of service for every school location. While many ICT services can be provided and maintained centrally, many school or location-specific technologies and services also require a level of onsite support. [35]

As this report outlines, this electronic vision for education is still a work in progress.

Computers in schools

In 2011, the census taken of computers in schools indicated an average of 1.5 students per computer. The trend for computer usage over the past several years is illustrated below.[36]

35 Submission No. 15 from Department of Education, November 2011, p4.
36 Ms Sharyn O'Neill, Department of Education, letter dated 18 June 2012.

Table 2.1: the number of students per computer 2008 to 2012[37]

	2008	2009	2010	2011	Current estimate
Primary	4.5	4.3	4.3	4.0	3.8
Secondary	2.9	2.7	2.2	1.5	1.0

Since then 26,561 computers have been purchased under the Federal initative the National Secondary School Computer Fund. This has resulted in an improvement in the ratio of computers to students. The National Secondary School Computer Fund, as the name suggests, is only applicable to secondary schools.

In 2012, the Census is being broadened to try to capture the range of technology currently used in schools but the results of that survey will not be available before this Report is completed.

The National Secondary School Computer Fund

The National Secondary School Computer Fund (the Fund) is assisting schools and school systems to provide new computers and other ICT equipment for students in Years 9 to 12. Education authorities across the country have installed more than 911 000 computers, exceeding the original target of 786 000 computers by the beginning of the 2012 school year.

Through the Fund, the Australian Government is providing funding of $1000 per computer and up to $1500 for the installation and maintenance of that device.

The Fund is a universal access program and is assisting schools in the public, Catholic and independent education sectors, regardless of location. Implementation of the Fund is happening in partnership with government and non-government education authorities who are responsible for purchasing ICT equipment best suited to the needs of their schools.

Depending on need and preference, schools can purchase netbooks, laptops, tablet computing devices, install more desktop computers or deploy a mix of mobile and stationary devices. Funding has also been made available for specialised ICT equipment to benefit students with disability.[38]

> *This initiative has significantly impacted the high schools, for years 9 to 12, which are the target of the program. Overall 228 schools were*

37 Ms Sharyn O'Neill, Department of Education, letter dated 18 June 2012.

38 Department of Education, Employment and Workplace Relations, *National Secondary School Computer Fund*, 2012. Available at: http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/ComputerFund/Pages/NationalSecondarySchoolComputerFundOverview.aspx. Accessed on 27 June 2012.

> *recipients with over 49 000 computers acquired. This brings the computer: student ratio to one computer for every student in years 9 to 12 in those schools. All schools have met that target, apart from SIDE, and SIDE is expected to meet its target by June this year.*[39]

The initiative is to end in 2014 and there is reportedly some concern in all states as to whether it will be renewed in any form given the raised expectations this initaive has created with parents.

Finding 3

Under the Federal initiative, the National Secondary School Computer Fund, schools can purchase netbooks, laptops, tablet computing devices, install more desktop computers or deploy a mix of mobile and stationary devices. This has seen the ratio of computers to students in high schools rise to 1:1.

Software and Standard Operating Environment

What is a Standard operating environment - SOE?

As outlined in Chapter One, every network, not least the Department's, has an operating system. A standard operating environment (SOE) is the term given to a predefined setting and application applied to the network operating system. The SOE achieves a reduction in the cost and time to deploy, configure, maintain, support and manage computers, by standardising the hardware and software platforms used within an organisation.

In recent years, the Department has moved to create a standard operating environment (SOE) that gives all schools maximum flexibility with both hardware and the software used.

> *Schools operate any type of software they believe is educationally of value to them and their kids. The software issue is quite difficult. They should not have problems communicating. This is why we are doing that thing called a "standard operating environment". It is much simpler for schools to do that cross-communication.* [40]

SOE4

In 2004 the Education Department initiated a state funded project known as the 100 Schools Project which , using a standard operating environment known as SOE3, provided 106 schools with a split network – administration and curricula. This initiative

39 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p23.

40 Mr Bevan Doyle, Chief Information Officer, Department of Education,, *Transcript of Evidence*, 21 March 2012, p5,6.

was subsequently extended to another 105 schools and became known as 'Learning with ICT.' With improvements to technology over the intervening period, the Department was able to improve the standard operating environment which, in its updated version, is known as SOE4.

Prior to SOE4, schools needed three servers in each school and operated on two networks. With SOE4, schools now only require one server which is replaced every five years at Central Office expense and overall costs are reduced by 66%.[41]

SOE4, which is still being rolled out, allows schools to use any physical device they choose, whether PCs, Apple, or tablets and iPads. In terms of each school, class or student, there are a broad range of applications that is permitted to be loaded onto the devices.[42]

> *We are building this world that is quite independent of those devices. Those basic operating systems like Windows, Apple all work with the SOE because it is designed to make sure it does that.*[43]

Underpinning the effectiveness of the SOE4 is a wireless network in schools.[44] This facilitates the removal of some technical hardware including servers, and reduces the technical complexity needing support in schools as infrastructure becomes increasingly centralised. The schools are then only responsible for peripheral hardware such as personal computers and lap tops. The SOE4 additionally provides an automatic backup of all systems for schools overnight, further reducing requirements on school staff.

The Department of Education advised that all school staff are able to attend professional development accredited courses in relation to the SOE4, which is further supported by 'a whole lot of tech notes and information regarding what it is that is happening, what they can do, and what the processes are around all those types of things.[45]

When fully rolled out, the state-wide deployment of a SOE4 will enhance the Department's capacity to deliver its services in metropolitan, regional and remote settings through one coordinated network.

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41 Briefing Mr Glenn Venn, Director Infrastructure and Telecommunications, Department of Education, 22 August 2012.

42 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p6,7.

43 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p6,7.

44 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p6,7.

45 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.

While SOE3 was funded by the state, SOE4 is funded by the Federal government through its Digital Education Revolution (DER) initiative. Consequently, new schools connected to SOE4 are high schools. Those primary schools using SOE3 will convert to SOE4 when their infrastructure is due to be replaced. However, at this point in time the pace of the rollout is restricted by available funds and is largely confined to the senior high schools.[46]

Where schools are too small and do not have a technical resource in the school, or where they lack priority for the roll out but want to proceed using their own resources, the school may use externally contracted integrators.

> *Each of those contractors have to be accredited for working in our schools so that they can manage the standard operating environment and understand how it works and how it should be put together.*[47]

On completion the SOE4 will reduce costs and improve efficiencies as well as improving services.

To date the Department has spent $14 million on the SOE rollout which is funded through the DER - National Secondary Schools Computer Fund which is providing a four year grant totalling $47 million. 'We are using that for wireless networks and for that part of the SOE in those high schools.' [48]

Some 400 primary schools are still outside SOE4 (55% in the regions and 45% in the metropolitan area). Out of 228 high schools, 120 use SOE4. The SOE4 achieves significant cost savings in IT and has enabled the ICT budget to be reduced in line with the State government's required 1% efficiency dividend.[49]

While there are significant capital costs to be incurred in the full roll out of SOE4, the Department believes that the return on investment through improved efficiencies, reduced hardware, and reduced support needed in schools would be such as to recover further capital expenditure within relatively few years.

Finding 4

The cornerstone of the Department of Education's ICT strategy into the future is the deployment of a wireless standard operating system known as SOE4. However, funding

46 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p13.
47 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.
48 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p14.
49 Briefing Mr Glenn Venn, Director Infrastructure and Telecommunications, Department of Education, 22 August 2012.

is severely restricted and is largely dependent on Federal funding through the National Secondary Schools Computer Fund.

Recommendation 1

The Committee recommends to the Minister for Education that additional funding be provided in the 2013-14 state budget to allow the 'roll-out' of SOE4 to all schools in WA by the end of 2015.

With the rollout of the SEO4 there is improved opportunity for schools to communicate with each other and there are a number of trials in video conferencing taking place. [50]

A further benefit of the SOE4 is the significantly greater level of security it affords in a closed system 'where the best hackers in the state are inside the network'.[51]

In summary, the SOE4 is seen to provide the following benefits when fully rolled out:

- improved management capabilities;
- reduced support costs;
- improved security;
- improved asset management;
- faster deployment;
- increased availability;
- reduced procurement overheads;
- improved lifecycle management;
- reduced staff induction/training requirements; and
- increased user familiarity and engagement with ICT technologies.[52]

In 2012, the Department of Education was awarded the Western Australian State iAward in the 'e-Government' category for its Standard Operating Environment 4.53 It has also recently been awarded the 2012 iAwards National Company/Group for e-government and is the Australian finalist in the Asia Pacific e-Government awards.54

The iAwards 'honours both companies at the cutting edge of technology innovation as well as leading professionals across the industry. Most importantly, the iAwards honours the achievements of home-grown Australian innovators.'[55]

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50 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p6,7.

51 Mr Bevan Doyle, Chief Information Officer, Department of Education, Briefing, 13 August 2012.

52 Department of Education, *Annual Report 2010-11*, East Perth, Western Australia, p80.

53 Kinetic IT, *Kinetic IT helps clients gain national recognition*, August 2012, Available at: http://www.kineticit.com.au/news. Accessed on 14 August 2012.

54 Briefing Mr Glenn Venn, Director Infrastructure and Telecommunications, Department of Education, 22 August 2012

55 The 2012 iAwards, Available at: http://www.iawards.com.au/. Accessed on 22 August 2012.

Finding 5

The Department of Education's standard operating environment known as SOE4 is recognised nationally as technically innovative, winning the 2012 national iAward and is the Australian finalist in the Asia Pacific industry awards.

Software

Head office software

The central office administrative and human resource systems run on relatively integrated pieces of software that are accessible, at appropriate levels by schools and teachers alike. These are known respectively as 'Integris' and 'HRMIS'.

Integris

This is an international, technical software platform which is also used in the Northern Territory, and by Catholic Education. The Department modified the platform to meet its requirements. The Committee is advised that it is a centrally hosted and web-delivered solution that offers access to school information from the classroom, for teachers, pupils and their parents.

It has a number of key elements including finance, billing, the collection, management and analysis of statutory attendance records, asset management, behaviour incidents and academic performance.

The Department is currently seeking to upgrade Integris as a centrally hosted and web-delivered platform. At the same time, the Department has developed an in-house piece of software, known as Reporting to Parents, that has taken over some of the functions of Integris.

> *Reporting to Parents is a web-based reporting tool for monitoring, evaluating and reporting student achievement in Years K–12. It replaced a number of disparate and out-dated tools and provides a consistent, more efficient and user-friendly tool. Implementation to all schools is complete, enabling preparation and printing of accurate student reports for parents each semester for Years 1–12. The tool provides new functionality in a number of areas, including analysis reports that detail grades, student attributes and marks distribution.* [56]

HRMIS

HRMIS, or the Human Resource Management Information System, is the Department's human resource software package. It is web enabled, and appropriately accessible to all employees to view and/or update their personal details.

56 Department of Education, *Annual Report 2011-12*, East Perth, Western Australia, p48.

Schools software packages

Where once schools had to purchase their own software, all core software products such as Microsoft Office, virus protection and Adobe are now centrally funded. This not only secures economies of scale but the cost no longer has to be found out of the individual schools' ICT budget allocation.

The Department does not prescribe what software schools should or should not use; but, it will only provide direct support for the more broadly downloaded applications. These are broken up into three designated tiers of indicative support to assist schools in determining what software they choose. These tiers are as follows:

Tier 1 applications

> *Tier 1 applications are spread right across the system. Everyone is using them. They are quite straightforward office productivity things like Word and Excel and those types of things. They are Windows, or Apple; it depends on what device they are using.* [57]

Tier 2 applications

> *Tier 2 applications are if a school wants to use them, and they are generally fairly widespread around schools, we will help schools with that particular range of applications. Tier 2 would be an Adobe–Acrobat type of application that everyone uses to read documents.* [58]

Tier 3 applications

> *If the school is running MYOB it would not be in tier 2. It would be in tier 3; in other words, it would not be supported. Schools can choose to load up any number of applications. There are thousands of applications being used by schools, depending on their local communities and clients and those sorts of things. But we cannot support that. It is just impossible. So we try to create an environment in which these things will work. But the tier 3 issues are definitely a school's problem.* [59]

57 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p10.

58 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p10.

59 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p10.

Finding 6

While the Department does not prescribe what software schools should or should not use, it will only provide direct support for the more broadly downloaded applications in Tier I and Tier 2 applications.

Transition Issues

It is acknowledged in all sectors of commerce, industry and government that there are challenges in the transition process to update or implement technology. This is exacerbated where there are budgetary constraints which impose delays on the progressive rollout. The Community and Public Sector Union highlighted one such issue as follows:

> *Schools that are running on LWICT (Learning With Information Communication Technology) are restricted to out-dated Department of Education software such as Windows XP and Adobe Flashplayer 10.3. Most of the newer technology rolled out in schools will only run on newer systems – for instance, interactive whiteboards are programmed to run on Windows 7, and some educational software requires Adobe Flashplayer 11 to run. These schools report experiencing many difficulties with attempting to run newer technologies alongside the out-dated Department of Education systems.* [60]

i-Pads

The Department allows flexibility in terms of how schools use technology. Nowhere is this better exampled than in the use of iPads. Schools have the freedom to use iPads and similar devices. However, iPads have their own operating system and are aimed at usage by an individual and not by an enterprise such as the Department of Education, with its 'shareable environment'. As a consequence the Department does not provide support for them and:

> *When schools come to us and ask us for opinions, I do not tell them which device to choose but if they are considering iPads, for example, we remind them they are not a computer, first of all, and they are not a shareable device.* [61]

While acknowledging their benefits, the Department of Education does not, currently, actively promote their use although acknowledging their benefits.

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60 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p5.

61 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p8.

> *The question is really: how does that suit the school? The school makes that choice. I think the iPad tablet is terrific. It is mobile, light and attractive; they engage. They are the more modern learning environments, but the PC has its strength as well. We think the desktop would be a dying device. I do not think the desktop will last much longer. The notebook version of PCs will be the option, I think, in terms of PC devices. It is about mobility, broadening educational programs et cetera. It remains the school's choice as to what they do and all we ask is that they really consider those options.* [62]

> *[We] impress upon schools that a lot of planning goes in, and to try not to be impetuous with their decisions about the device. "You plan it, work with your community; you work with your kids; you work with all these sorts of things and get the environment and the culture right, and make sure this stuff will work effectively."* [63]

In contrast the Victorian Department of Education and Early Childhood Development is undertaking an 'iPads for Learning trial' as a joint initiative with the Apple Corporation. This trial provides some 600 accessible iPads to participating students on a one iPad-to-one student basis, 24 hours a day, 7 days a week for the term of the trial. The trial is investigating progressive and effective use of learning technologies in learning and teaching with a view to developing independent and self-initiated learning in students and thereby extending their learning beyond the classroom.[64]

From the Western Australian Department's perspective, the focus is centred on the teacher rather than the technology. In terms of the teacher, 'it is the school leadership and management that makes the biggest difference' and 'that is not something that is best bureaucratised.'[65] The Department is consequently faced with what it terms 'a delicate balancing act' in maintaining the standards across the system along with the resourcing, support and cost efficiencies while still enabling 'a greater local level of autonomy and innovation.' [66]

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62 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p8.

63 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p8.

64 The Department of Education and Early Childhood Development, *In their hands*, 2011, Available at: http://www.ipadsforeducation.vic.edu.au/userfiles/files/ipads_for_learning_21Steps.pdf. Accessed on 14 August 2012.

65 Mr Lindsay Hale, Acting Executive Director, Statewide Planning and Delivery, Department of Education, *Transcript of Evidence*, 21 March 2012, p9.

66 Mr Lindsay Hale, Acting Executive Director, Statewide Planning and Delivery, Department of Education, *Transcript of Evidence*, 21 March 2012, p9.

Finding 7

The Department of Education allows flexibility in the use and application of technology. Its philosophy is that 'it's not about the technology as much as it is about the teacher' and in terms of the teacher 'it is the school leadership and management that makes the biggest difference and that is not something that is best bureaucratised.'

Chapter 3

ICT in the Cloud

The future is one where the school does not provide the hardware but, using the 'Cloud', allows students to use their own devices, whatever they may be, with the relevant apps.[67]

What is Cloud Computing?

> *Although nearly everybody has heard the buzz around cloud computing, there are not so many people who understand how it will help them in day to day life. In the classroom, cloud computing will mean students only need light weight, low price electronic devices to access their work in the cloud. The expensive computing power will all be hosted by companies such as Google, Amazon and Apple who will offer storage and applications as a service. Students and teachers will be able to access all their work from any location on any device (laptop, tablet, phone, etc.) and lost homework will be a thing of the past with secure, backed up documents in the cloud.[68]*

Cloud Computing offers a mobile technology. In other words, individuals can access data from wherever they happen to be at the time. This changes the operating and business model for both government and business, not least education. Developing, deploying and supporting mobile solutions requires a different approach to the traditional desk-based IT.

Cloud technology, with its collateral mobility, empowers the individual user, facilitates collaboration and supports a user centric approach to ICT. This is evidenced in every school, through social networking, through e-learning, through the use of iPads and notebooks.

67 Briefing by the Centre for Educational Innovation and Technology (CEIT), University of Queensland, Brisbane, 5 July 2012.

68 Fractus Learning, *5 Current Technologies That Will Shape Our Classrooms*, Available at: http://www.fractuslearning.com/2011/10/27/5-current-technologies-that-will-shape-our-classrooms/. Accessed on 14 June 2012.

There are several forms that Cloud Computing can take and these are summarised in the following table.

Table 3.1 Cloud deployment models[69]

Cloud type	Features	Benefits
Public	For use by multiple organisations (tenants) on a shared basis and hosted and managed by a third party service provider. Computing resources accessed as external services, instead of as products that are purchased, installed and managed within an organisation.	Ability to rapidly scale the allocation of computing resources to match fluctuations in business demand. Utility-based pricing, so that users only pay for computing resources actually used (rather than full load capacity). Potentially large economies of scale.
Private	For exclusive use by a single organisation and typically controlled, managed and hosted in private data centres. The hosting and operation of private clouds may be outsourced to a third party service provider, but a private cloud remains for the exclusive use of one organisation. Currently, the most common form of cloud in Australia, and typically the first step in a company's cloud journey.	Considered to be the most secure option, but with reduced potential for economies of scale and productivity gains available through multi-tenant options.
Community	For use by a group of related organisations that wish to make use of a common Cloud Computing environment for example, local councils with a shared service offering. Effectively half way between private and public clouds.	Reduced economies of scale traded off for increased security.
Hybrid	Both private and public cloud models are adopted by a single organisation.	Allows for multiple deployment methods to meet specific business/agency needs.

69 KPMG, *Modelling the economic impact of cloud computing*, report prepared by KPMG, Australia, 2012, p8.

The Department's approach to Cloud Computing

World-wide there has been a slowly accelerating move to Cloud Computing. The biggest inhibitor to adoption has been, and remains, concerns around security of data. The issue goes beyond the risk of hacking and data storage integrity. Most Cloud solutions are based overseas and the question of data sovereignty is the issue. The Department's legal advice is that Cloud data falls under the host country's laws and there could be a significant reputational risk attached to third party access to their data.[70]

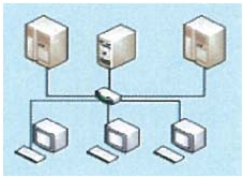
A study of American, European, and Australian legislation has concluded that 'it is not possible to isolate data in the Cloud from governmental access based on the physical location of the Cloud service provider or its facilities.'[71] The risk arises principally because 'governments need some degree of access to data for criminal (including cybercrime) investigations and for purposes of national security. But privacy and confidentiality are important issues.'[72] Access is allowed through both domestic legislation within the relevant countries and through international Mutual Legal Assistance Treaties.

This issue has underpinned the Department's slow approach to the adoption of public Cloud Computing. It is currently reviewing what information needs to stay onshore as it moves into the future.

In the interim, it will be apparent from the preceding chapters that the Department of Education is developing a 'private cloud' as it rolls out SOE4 with a goal of establishing a browser-based system.

In the traditional approach to IT in schools, each school has its own school based network, with its local (school based) network including servers, PCs, and printers as follows:

Figure 3.1 The traditional IT deployment model of servers and computers in a school:



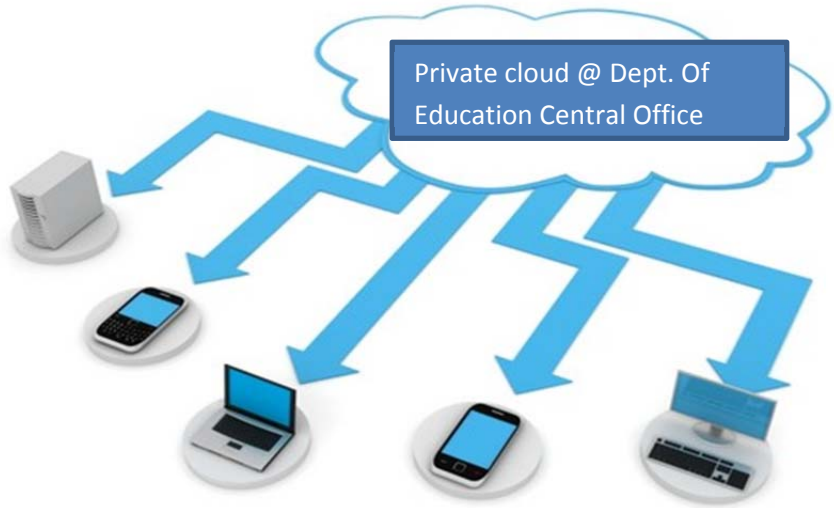
With the adoption of SOE4, the Education Department is moving towards a private Cloud deployment model which is illustrated as follows:

70 Mr Bevan Doyle, Chief Information Officer, Department of Education, Briefing, 13 August 2012.

71 A Hogan Lovells, White Paper, *A Global Reality: Governmental Access to Data in the Cloud*, report prepared by Maxwell, M. & Wolf, C., Washington, p2.

72 A Hogan Lovell,s White Paper, *A Global Reality: Governmental Access to Data in the Cloud*, report prepared by Maxwell, M. & Wolf, C., Washington, p1.

Figure 3.2 The 'Cloud' deployment model of ICT



In this deployment model, the individual schools no longer have servers and the private Cloud can be accessed through Wi-Fi by peripheral hardware such as personal computers and lap tops, whether using Microsoft or Apple software.

Additionally, the Department is building a platform that will provide a single login for teachers in any school or at home. The system will then provide and populate the webpage, on request, with that teacher's students, enabling the teacher to better plan lessons, set work for individual students and increasingly provide for student centred education.

The Department told the Committee that they were 'putting our toe in the water' of public Cloud Computing using Microsoft Office 365 for students to both store their material as well as their emails. Office 365 is Cloud-based and so allows the students to access their files from anywhere as well as share and collaborate.

The Department is moving cautiously to a hybrid Cloud deployment model which is comprised of its private Cloud system and a public Cloud system using Microsoft.

Finding 8

With the adoption of SOE4 the Education Department is moving towards a private Cloud deployment model. It is also investigating public Cloud Computing, using Microsoft Office 365. This will allow students to store their school material as well as their emails. The Department is, therefore, migrating cautiously to a hybrid Cloud deployment model which is comprised of its private Cloud system and a public Cloud system offered by Microsoft.

The economics of Cloud Computing

Cloud Computing is revolutionising the way companies use information technology. Cloud service providers make it possible for businesses and consumer users across the globe to access services via the Internet, reducing costs and increasing efficiency.

In a recent study that looked at the economic impact of Cloud Computing, KPMG found that there is a strong economic case for the adoption of Cloud services. In particular it found that over a ten year period, operating expenditure would reduce by 25% and capital expenditure would reduce by 50%.[73] The reason was outlined to the Committee as follows:

> *The nice thing about [Cloud Computing] is you should not need that much infrastructure in your school. Basically, all you need is a web browser and a good internet connection. The whole expense, of course, with IT is maintaining it and upgrading it all the time. You can reduce those costs by focusing on just the client—your web browser and your local PC.*[74]

Identifiable savings are achieved through reduced IT maintenance, reduction in peripheral hardware such as servers in schools, and greater economies of scale. In addition, if the Cloud type is a public one then 'changes to business can be achieved without the need for capacity planning, changes to installed technology or new technology purchases. [75]

Finding 9

Using private or public Cloud based deployment models, an individual school's output can be maintained with less technology input, freeing up teacher and ICT technicians' time while reducing costs. The business case for Cloud lies in its ability to provide capacity-efficient layers of IT while reducing costs.

73 KPMG, *Modelling the economic impact of cloud computing*, report prepared by KPMG, Australia, 2012, p7.

74 Dr Ashley Aitken, Senior Lecturer, School of Information Systems, Curtin University, *Transcript of Evidence*, 9 July 2012, p4.

75 KPMG, *Modelling the economic impact of cloud computing*, report prepared by KPMG, Australia, 2012, p7.

Chapter 4

The issue of ICT support

The single biggest ICT issue raised with the Committee was that of the inadequacy of the school budget to cover the cost of providing ICT support. It is an issue that the Department acknowledges.

ICT support in schools

ICT support is provided for schools at two levels. The first is support from head office; the second is support that the schools are individually expected to pay for out of their ICT budget. Schools may contract in such support using third parties, for example TFX, Solutions IT, and Magill's Computer Solutions, which 'are contracted to provide 'on the ground' ICT support to schools when it is required.'[76]

Alternatively, some schools employ their own technical support officers.

Head office support

The Department provides support, at no cost to the individual schools, at several levels.

At a primary response level, there is a customer service centre, or help desk. The Customer Service Centre (CSC) helpdesk is run by a private company, Kinetic IT. It provides support to schools in terms of a number of devices on the school site, including the administrative network and administrative systems. Additionally, it can assist to resolve a difficulty in a classroom. Should a school run into a particular problem on their networks that is complex, it will help and assist from the centre. [77]

Annual satisfaction surveys of the service are conducted. In the 2010-11 financial year (last year available) ninety per cent of survey item responses rated the service as satisfactory or better. In 2010, 'the ICT Customer Service Centre was selected as a finalist in the Service Delivery and Training category of the prestigious 2010 WA Information Technology and Telecommunication Awards.'[78]

76 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

77 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p3.

78 Department of Education, *Annual Report 2011-12,* East Perth, Western Australia, p78.

It operates seven days a week. 'We go till 10.00 pm weeknights, and on weekends we go from 10.00 am until 4.00 pm.' [79]

However:

> *It is important to note here that schools which do not have the SOE4 (Standard Operating System) cannot be accessed remotely by the CSC. The Department of Education is currently implementing SOE4, which in theory will ensure that all schools are operating under a common system and can be provided with standard support. The roll-out has been extremely slow, however: while high schools have been prioritised to be converted to SOE4, there are also 395 primary schools yet to be moved on to SOE4. The schools that are not on SOE4 cannot be supported remotely by the CSC; this includes the curriculum server.*[80]

Finding 10

While the Department provides a high standard of service through its ICT Customer Service Centre, schools without SOE4 cannot be accessed remotely by the ICT Customer Service Centre, impeding an effective response.

The Department contracts at a strategic level to maintain a reasonable standard across the organisation, effect economies of scale and facilitate the sharing of resources. [81]

The long term aim is to provide centralised support to all schools including for computers supplied under the National Secondary School Computer Fund. However, currently schools fit into one of three categories of support from head office:

- *A standard school is supported in the administration block, but not in the classroom block, because of varieties of stuff that can happen in the classroom.*
- *Schools in a number of our programs also receive support end to end, and they would be included in our program that we call "Learning with ICT", and there are about 200 schools in that. They get technical support available, end to end, from central office.*

79 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.

80 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

81 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p3.

- *Then there is a group, like the National Secondary School Computer Fund, that get support in that way.*[82]

School initiated support

Schools are given a budget allocation for technical support. They then establish their own priorities within the context of their resourcing. However, in the larger secondary schools it is the practice that the schools will decide to pay the salary for an ICT support technician. This does not come out of their ICT budget but out of their salaries line item. In other words, the salary used for an ICT technician is at the opportunity cost of employing another teacher. The Principal determines the relative staffing priority. This is particularly the case for Independent Public Schools.

The prioritisation may be based on an industry standard which

> *says something like, when you have 500 computers, you probably need one person to look after them. But that is an industry standard, and it varies depending on who they are.* [83]

Arguing strongly that a 1:500 ratio is totally inadequate, the Community and Public Sector Union advised the Committee that it had pulled together a working party of ICT officers from different schools to try to develop a ratio for *staff to computers*. This group 'for the most part, said that what would be best would be one ICT support officer per 200 computers'.[84]

Schools' ICT budget

The costs of developing and maintaining a school's ICT infrastructure are significant. In Western Australia, each school receives an ICT grant. The total cost to the Department is around $18 million per annum. The amount that any individual school receives is based on a calculation of the number of students, their location and any other attributes of the school. The metric is not based on the number of computers and other peripherals in a school because if the school purchases or leases equipment beyond the established metric, then part of their responsibility in making that purchase is the maintenance of that additional equipment.

Out of their individual budget, schools are required to:

82 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.

83 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.

84 Ms Rikki Hendon, Branch Assistant Secretary, Community and Public Sector Union/Civil Service Association, *Transcript of Evidence*, 9 July 2012, p2.

- *'maintain a minimum computer-to-student ratio. In high schools it is one for every five kids. In primary schools, it is one computer for every 10 children.'* [85]

- *'The remainder of that funding is for associated tasks with technology; it can be technical support, it can be professional development, it can be the acquisition of other equipment.'* [86]

To assist schools, the Department, through its 'Customer Relationship Management' strategies, offers advice on planning and tools for budgeting for ICT resources. It advises on schools ICT refreshment strategy and reports any concerns that schools might have back to the head office.

Certain costs, as previously outlined, are managed outside the school through central budgets. The costs that are managed within schools are generally funded by:

- The general school operating grants as well as parental contributions;

- ICT grants from the Department, and/or Digital Education Revolution funding from the Australian Government.

Additionally the new school networks are collaborating to contract a technical support officer between groups of schools. [87]

Is the ICT budget and level of support adequate?

The single biggest ICT issue raised with the Committee over the course of this Inquiry was that of the inadequacy of the school budget to cover the cost of providing support. It is an issue that the Department acknowledges and arises out of its budgetary constraints which is then reflected in school budgets.

Many ICT services can be provided and maintained centrally, particularly as the Standard Operating Environment 4 is rolled out. However, many school or location-specific technologies and services require a level of onsite support. [88]

The Department advised that:

85 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.
86 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p24.
87 Ms Sharyn O'Neill, Director General, Department of Education, *Transcript of Evidence*, 9 May 2012, p25.
88 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

> *Technical support is an issue in some of the schools. Schools have a variety of ways in which they address that. Most, if not all, of the bigger schools would have at least one permanent technician on staff … It is a priority within the school as to what their staffing establishment is and where their priorities are. So the school will decide the make-up of that staff. As I said, the big schools, which are virtually small enterprises technically, will have a technician on staff.*
>
> *The other arrangements are through what we call the ICT grant. Schools first of all have to maintain a minimum ratio of devices on the student's desk. Once that money is spent, they have got other options on which they can spend that money, and that includes technical support arrangements by contracting in what we call a systems integrator, which is a technical support contractor. Others choose to use a parent or a guardian.*
>
> *One school had the gardener doing it for a while because they had a bit of technical knowledge. The difficulty in country areas, of course, is that the further out you get, the harder it is to get those skills.* [89]

However, the Community and Public Sector Union has a number of reservations about the current situation. From the Union's perspective:

> *The real issue that we have identified is that the Department of Education does not allocate ICT officers to schools as part of the staffing formula for the schools, so schools must fund positions from their own budget or trade-in part of their teacher allocation for ICT officers.*
>
> *Some schools are more able to do that than others, depending on what they have to play with. Primary schools in particular tend not to have a lot to play with and for the most part they do not have ICT officers, although there may be some exceptions to the rule. Where they are employed, ICT officers are responsible for the set-up, maintenance and ongoing support of technology in the school.*
>
> *Where they are employed they are responsible for setting up computers and other devices; supporting staff and student computers; service support; maintenance and upgrades; other technologies, including interactive whiteboards, photocopiers, printers; access to interactive web-based programs; audio visual and video conferencing*

89 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p3.

> *equipment; software equipment acquisition; planning technology upgrades; telephone system support; LED screens for the school signs that sit outside the school; back-end of school website support and front end as well, if the normal editor is absent—the normal editor tends to be a deputy, a teacher or a registrar for the most part. They are also responsible for dealing with mobile devices for both staff and students, and other duties as required. That is a quite a long list, and that is a fairly substantial workload we are looking at there, so there is quite a big body of work to be done in schools.*[90]

And

> *Although the Department acknowledges here the importance of ICT Officers in delivering eLearning to schools, this is not reflected in the resourcing. ICT Officers are not allocated to schools from the Department of Education as part of the staffing formula; instead, schools must fund their own ICT Officer positions from their budgets, or trade-in part of their teacher allocation to provide for ICT Officers. This means that the level of ICT support staff can vary across schools; typically primary schools have no ICT Officers, metropolitan high schools have varying levels of ICT Officers employed, and regional and remote schools can have no ICT Officers.* [91]

One school that requested anonymity advised that its ICT support is 'totally inadequate'. It has 130 school computers and cannot afford a technician on the available $60,000 that 'it can squeeze out of its budget.'

One University advised the Committee that in its view the 'number of personnel to support the IT infrastructure is nowhere near what you would expect in most businesses.'[92] The consequence being that 'a lot of equipment is not fixed; it cannot work properly.' [93]

Finding 11

There is broad acknowledgement that the lack and quality of ICT support in the schools is an issue. The level of ICT support staff can vary across schools; typically primary schools have no ICT Officers, metropolitan high schools have varying levels of ICT

90 Ms Rikki Hendon, Branch Assistant Secretary, Community and Public Sector Union/Civil Service Association, *Transcript of Evidence*, 9 July 2012, p2.

91 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

92 Dr Christopher Newhouse, Educational Researcher, Edith Cowan University, *Transcript of Evidence*, 9 July 2012, p5.

93 Dr Christopher Newhouse, Educational Researcher, Edith Cowan University, *Transcript of Evidence*, 9 July 2012, p5.

Officers employed, and regional and remote schools can have no ICT Officers. It is anecdotally reported that 'a lot of equipment is not fixed'.

For some schools the problem is seen to be that the available dollars are based on school size and not on the number of computers in the school. One primary school registrar outlined the situation in her school as follows:

> *I have been at my school for 10 years. When I first went there, there was about 410 students. There is now only about 330. Over that 10 years, our IT allocation has dropped from around about $25,000 a year to about $16,500. So this year we got approximately $16,500. With that, we need to be replacing our computers. The department's policy is that they should be replaced approximately every four years. We have to replace three servers. The servers have to be replaced every three years, and they cost around $3,000 each. Over a three-year period, we are looking at $9,000 to $10,000 just in server costs alone. Then of course you have got your printers—all that sort of thing. Two years ago we decided to put interactive whiteboards into our school. We had not had them before. We did not have the money so we did a lease. It was $68,000 over three years for the lease of interactive whiteboards. That still does not give an interactive whiteboard for our kindergarten students. As I say, if you are paying for the IT tech to be done, you are trying to replace some computers, even if you replace only 10 a year, you are still looking at nearly $9,000 or $10,000. Then, as I say, we have the lease.* [94]

And

> *If there is something that goes wrong—the principal does dabble a little in computers at our school, and in the past we have had teachers who have had the knowledge; we do not have that this year—then really be have to wait until an outside provider comes in. We pay for that service. We pay $5,600 for 70 hours of support. That can run for 18 months, but we will use that up all this year. In that amount, for each visit to the school, half an hour of that is travel time for them to come to our school. Our school is in Rockingham, so it is classed as the metropolitan area. So it is not cheap; it is not a cheap service really. How we worked in the past is that we have organised regular visits, so it might be half a day a week or half a day a fortnight when we just, standard, have somebody coming out. However, if a problem occurs*

94 Ms Joyce Bootsma, School Registrar and Community and Public Sector Union/Civil Service Association of Western Australia representative, *Transcript of Evidence*, 9 July 2012, p4,5.

> *three days after they have been, we ring up. It might be two days before we can get a technician out. So you can imagine if the teachers cannot access their computers for two days, which becomes a problem.*[95]

The Department advises that as SOE4 is rolled out the cost of replacing servers will be extinguished as they will no longer be required. The Department also advises that it provides one electronic whiteboard per school and that anything beyond that is up to the school's budgetary determinations.

School survey on ICT workload

In 2011, the CPSU/CSA and the Department of Education jointly surveyed a sample of schools about the ICT support workload issues at their school. The 54 schools surveyed represented various sizes, geographical locations, and ICT systems. Of the 54 schools surveyed:

- 21 schools have dedicated ICT Officers (2 of these were Primary Schools);
- of these 21 schools, 11 still require additional ICT support from other staff. [96]

Table 4.1: The schools that were surveyed identified the under listed staff member/s responsible for ICT support at their school.[97]

Staff member	No. of schools who identified ICT support provided by this staff member
Principal	3
Deputy Principal	9
Teacher	28
Business Manager/Registrar	27
School Officer	10
Library Officer	7
ICT Officer	21
Private contractor	17

95 Ms Joyce Bootsma, School Registrar and Community and Public Sector Union/Civil Service Association of Western Australia representative, *Transcript of Evidence*, 9 July 2012, p4,5.

96 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

97 NB: The total adds up to more than the total number of schools surveyed, as some schools indicated that more than one staff member was responsible for the provision of ICT support at their school.

The survey found that the ICT Customer Service Centre (CSC) helpdesk was satisfactory at answering queries, but 'they are limited in the assistance they can provide remotely. They can assist with a number of software issues, but can only talk staff through issues relating to hardware.' [98]

> *The CSC talk school support staff through how to resolve a particular hardware problem, however sometimes the problems are too complex to be successfully resolved over the phone. This arrangement is inferior to having an ICT Officer directly employed by the school, as it is often the case that if there are ICT issues then they have to wait days or weeks to be addressed by these support companies. The survey results showed that it was not uncommon for schools to wait 2 weeks for a problem to be resolved. The wait-times are exacerbated by distance; one remote school reported that it could take up to 25 days for a company to come out to the school and resolve an issue.*
>
> *These long delays are inconvenient, and lead to inefficiencies in the school and teachers not being able to utilise ICT in their classrooms. These companies have limited knowledge of Department of Education policies and processes, and know little about the processes and preferences of individual schools.*[99]

'It's insecure and low pay employment'

Most ICT officers are employed on fixed term contracts. One ICT officer advised that he had applied for his position about three times in the past seven years. [100]

> *This often leads to ICT staff securing work elsewhere, with a resulting loss of institutional knowledge as new staff familiarise themselves with the school systems.*[101]

Pay levels for ICT officers are advised as being low compared with the private sector, as well as inconsistent between schools, ranging from level 1 to level 5 positions for similar duties. The exception to this is where ICT Officers are appointed permanently in Independent Public Schools.

98 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

99 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

100 Mr Russell Clarke, ICT Officer, Community and Public Sector Union/Civil Service Association of Western Australia, *Transcript of Evidence*, 9 July 2012, p8.

101 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p6.

> *These schools have more autonomy and control over their budgets, and so have the capacity to appoint more support staff on an ongoing basis. Another exception is staff that have permanency in a previous role, but have been transferred across to IT support as they have the highest level of IT skills of available staff within the school.* [102]

Regional issues

Technical support

In regional Western Australia 'the further you get away from major regional centres, the more difficult it is to get any range of skills and, I think, technical skills more so.' [103] The situation is compounded by the demand for skills in the mineral resources sector.

> *There just isn't sufficient money for all the technology that is needed. The problem is in part one of capacity, and of an inability to get repairs and support work done. Any electricians in the area work for the mining companies, not for the local people, because the money is so much better.*[104]

Finding 12

In some regions, competition for skills with the mineral resources sector further exacerbates the difficulties in getting ICT repair and support.

As the Department has moved towards decentralisation, 'there are some schools that pool money and contract technical support, but when something breaks down a person has to travel to come and assist them, so it is the same as problems that we have with maintenance.'[105] The travel costs can be quite inhibitive in the regions where accommodation may also need to be paid for.[106]

> *Regional schools have to pay for not only the contractor the way metro areas would, but they tend to have to pay for travel and sometimes accommodation, and that is prohibitive in terms of the budget they have to play with. We have, again, anecdotal evidence that schools tend to basically gather a lot of problems before they engage someone. They wait until they have a substantial body of work to be done and then get somebody up. There may be a number of issues or*

102 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p2, 3.
103 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 9 May 2012, p25.
104 Briefing by Teacher at Pilbara Regional Development Authority Forum, Karratha, 12 March 2012.
105 Ms Sharyn O'Neill, Director General, Department of Education, *Transcript of Evidence*, 9 May 2012, p25.
106 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p1.

> *computers that have broken down but they have to wait, otherwise it is not very cost effective.*[107]

This significantly impacts the effective use of ICT in the regions.

One model being considered by the Department is working with senior high schools in country regions, to create clusters that can employ an ICT full time equivalent as an alternative to contracting all support.

> *The senior high school could possibly provide additional service to those smaller feeder schools that are in the district and those sorts of things to maximise the use, again, across networks and using technologies to help that out.* [108]

Internet connection

Internet connections on which much of the Department's ICT strategy is predicated can be unreliable, particularly in the regions.[109] The Committee was told that there is a current need for good bandwidth with stable connections so that schools can all operate on the same systems and form linkages. Because of perceived shortfalls due to budgetary constraints, one regional education office has applied for Royalties for Regions funding to catch up on ICT. [110]

> *Someone who is experiencing a hardware problem needs to be able to describe the problem in a level of detail. Depending on that person's understanding of technology, they may not be able to do that, and then they have to understand the instructions that come through from the other end. From the consultations we have had with our members that can be a very time-consuming process. Basically, it means there are delays in actually resolving issues, and it is not done very effectively. In some cases the issue cannot be resolved that way at all. In some instances, where there is no support, contractors can be brought in to do some of the more complex work, but this tends to be quite expensive and it takes a lot of time to get those issues resolved that way. It is especially a problem for regional schools.*

The Association of Independent Schools of WA, in noting that 'the further away we get from the city, the more problematic the connectivity is' advised that in trying to address associated costs of connection, they have established an arrangement with

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107 Ms Rikki Hendon, Branch Assistant Secretary, Community and Public Sector Union/Civil Service Association, *Transcript of Evidence*, 9 July 2012, p2.

108 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p4.

109 Briefing Kimberley Education Region, Department of Education WA, 14 March 2012.

110 Briefing Pilbara Education Regional Office, Department of Education WA, 12 March 2012.

Telstra that is giving a cheaper rate of access 'but the buy-in favours the large schools, not the smaller schools.'[111]

Remote Schools and Distance Education

The issue of ICT support is also a concern for the School of Isolated and Distance Education

The School of Isolated and Distance Education (SIDE) also encounters issues with lack of ICT support in schools. SIDE delivers curriculum units to students in rural and remote areas and to schools all around the state where there are insufficient student numbers enrolled in a particular unit for the school to justify running it. SIDE relies on ICT to deliver these units, and in schools where there are no ICT Officers employed, or there is poor infrastructure, there are difficulties in delivering the curriculum to students. Where schools do not have any staff with enough ICT expertise to assist - e.g. to download the latest version of a web browser required to run a particular program for the distance education students - this lack of ICT support on-the-ground has a serious impact on delivery of learning outcomes.[112]

Libraries

> *It should be noted that although some schools are able to get remote support from the CSC, the CSC does not support library servers. This is due to the fact that each school sources its own software product for use in the library. This situation means that each school must find their own solutions for supporting the library, generally utilising support from the provider company, and often this work can fall to the level 1 or level 2 Library Officer. Library Officers also often undertake troubleshooting for computers in the library used by students. This troubleshooting occurs in situations where a class of students may be utilising the library for research and learning, and so immediate support is required to resolve the issue quickly (and therefore the use of an IT service provider company in this scenario would not be efficient or effective). In these situations an ICT Officer located at the school would be able to provide immediate support, and the ICT Officer would most likely be able to resolve the issue more efficiently than a Library Officer who is not trained in ICT support. Having an ICT Officer based at the school would lead to issues being resolved more*

111 Mr Ronald Gorman , Deputy Director, Association of Independent Schools of WA, *Transcript of Evidence*, 2 May 2012, p11.

112 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p5.

> *efficiently and free up the Library Officer to carry out their core duties.*[113]

Addressing the issues

Industrial Relations Commission

Over the past three years the issue of ICT support has been in and out of the Industrial Relations Commission. 'It is recognised there is a workload but the department cannot agree on a formula for how to address it and how much time et cetera needs to be given to us.' [114]

Anecdotally, part of the extensive delay in reaching a resolution is the changing array of people representing the Department due to promotions or transfers. To date there has been no independent assessment carried out on the required staff metrics for ICT support. [115]

The Technology in Public Schools Alliance

A group of stakeholders has formed the Technology in Public Schools Alliance (TPSA).

> *TPSA has been formed out of shared concern for the poor state of information and communication technology (ICT) in our public schools. The number and diversity of organisations that have joined to form TPSA demonstrates the extent to which school communities identify ICT as matter which requires Government's urgent attention.*[116]

The members of the group are:

- Community and Public Sector Union/Civil Service Association of Western Australia;
- State School Teachers Union of Western Australia (SSTUWA);
- Western Australian Council of State School Organisations Inc. (WACSSO);
- Western Australian Primary Principals Association (WAPPA);
- Western Australian Secondary School Executives Association (WASSEA);

113 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p2, 3.

114 Ms Joyce Bootsma, School Registrar and Community and Public Sector Union/Civil Service Association of Western Australia representative, *Transcript of Evidence*, 9 July 2012, p4,5.

115 Ms Joyce Bootsma, School Registrar and Community and Public Sector Union/Civil Service Association of Western Australia representative, *Transcript of Evidence*, 9 July 2012, p4,5.

116 Rikki Hendon, Community & Public Sector Union/ Civil Service Association, Electronic Mail, 17 August 2012.

- Western Australian District High School Administrators' Association (WADHSAA);
- Western Australian Education Support Principals' and Administrators (WAESPA);

The primary objective of this alliance is to secure additional funding for ICT infrastructure and support in public schools, notably:

- Funding for ICT systems and infrastructure;
- Funding for ICT support staff at 1FTE per 200 computers, with a shared resource for schools with less than 200 computers; and
- Funding to provide training for IT officers and other school staff. [117]

By one estimate, the cost of providing technicians in the ratio of 1:200 computers would be approx. $60-70 million per annum. However, were SOE4 to be rolled out across the state these costs would be significantly reduced, as would the number of technicians required.

Finding 13

The issue of the provision of ICT support has been in and out of the Industrial Relations Commission for three years without resolution. An alliance of six major stakeholders has now been formed to try to secure additional funding from the government to address:

- Funding for ICT systems and infrastructure;
- Funding for ICT support staff at 1FTE per 200 computers, with a shared resource for schools with less than 200 computers; and
- Funding to provide training for IT officers and other school staff.

Recommendation 2

The Committee recommends to the Minister for Education that additional funding be provided in the 2013 budget for ICT support staff to schools at 1FTE per 200 computers, with a shared resource for schools with less than 200 computers.

117 Rikki Hendon, Community & Public Sector Union/ Civil Service Association, Electronic Mail, 17 August 2012.

Recommendation 3

The Committee recommends to the Minister for Education that additional funding be provided in the 2014 budget to facilitate a bi-annual independent assessment of FTE ICT staff required in state schools.

Chapter 5

e-learning and e-schooling

'Cloud is about how you do computing, not where you do computing'[118]

The Education Department has an 'educational vision' for online, classroom-centric services and tools to enable teachers, students, administrators and parents to collaborate in planning, creating, delivering, learning, assessing and reporting anytime, anywhere.[119] In this context, the Department submitted a funding request to Cabinet outlining the business case for the provision of an online, modern schooling delivery model. The request for funding was deferred pending the closer definition of its parts.

> *This model is based on the principle that all schools, regardless of their physical location, should have access to reliable, secure, easy to-use tools to cater for their individual students' learning needs. Learning will flourish if student and teacher needs are at the core of system design, development and delivery.*[120]

The deferment means that the current budgetary constraints remain. These, as previously outlined, inhibit a speedy roll out of the Standard Operating Environment 4 upon which the 'educational vision' rests.

It is the Department's view that e-learning programs have the potential to deliver improved services and tools for schools coupled with quality professional support by providing:

- *a secure entry to services that enables schools to select the online learning tools and services, web conferencing, blogs and emails that better meet their communities teaching and learning heeds;*
- *a means by which the Australian Curriculum can be used in the context of online learning;*
- *digital resources that can be discovered, shared, rated, commented on and incorporated into lessons;*

118 Paul Maritz, CEO of VMware Available at http://www.thebackuplist.com/5-quotes-cloud-computing/ Accessed 5 September 2012.
119 Submission No. 15 from Department of Education, November 2011, p2.
120 Submission No. 15 from Department of Education, November 2011, p2.

- *data from NAPLAN and reporting systems that can be viewed at the same time as lessons are designed and delivered;*
- *the capacity for all schools to offer flexible curriculum delivery methods between and within schools that may involve full or partial ICT solutions;*
- *for secondary students, access to a broader range of subjects to enable students to have a range of post schooling options and reach their potential;*
- *parental engagement where parents can actively participate in and support their child's learning (e.g. view the assessment tasks, marks and attendance patterns) through secure access and involvement in classroom activities;*
- *coaching and support for staff in the use of enterprise platforms for online professional learning and web conferencing tools; and*
- *support to help schools understand and implement their distinctive online learning solutions.*[121]

Even as it supports e-Learning in its many dimensions, the Department remains unequivocal that the core factor in achieving strong educational outcomes remains high quality teacher capacity. The technology simply leverages that capacity; a poor teacher with poor pedagogy will use the technology to limited effect.[122] The focus is therefore:

> *To equip our teachers with the best contemporary tools; but it is not a replacement for quality teaching. It is premised on the basis that you want the most able teacher that you can find first and foremost, and then equip them with the most contemporary and effective tools.* [123]

And

121 Submission No. 15 from Department of Education, November 2011, p2.
122 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p11.
123 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p11.

> *It is not the technology that makes the difference; the technology is the box of wires and lights and that sort of thing. It is how that stuff is used effectively by a teacher.* [124]

As is the case with the demonstrable success of interactive whiteboards in improving literacy and numeracy levels, touched on in Chapter One, it is well established that technology needs to become embedded in pedagogical practice to optimise its benefits.

e-Schooling 2012

The Department is focussed on developing systems that allow for a seamless integrated approach to accessing and sharing information as well as utilising other e-learning strategies.

Central office has structured the use of ICT in schools, known as e-Schooling, around five areas; these seek to reflect the 'spirit' of the Economic Audit Committee's recommendation to 'improve eligible users' access, including through citizen-centred information and communication technology solutions.'[125] [126]

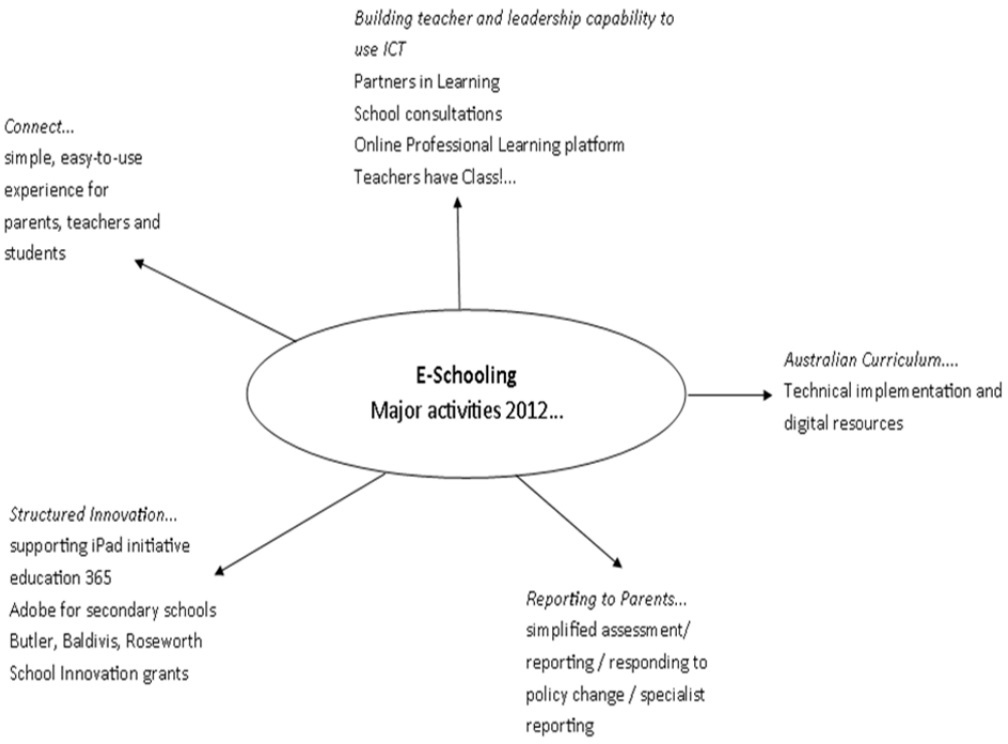
The five areas of e-Schooling is illustrated as follows:

124 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p12.

125 Economic Audit Committee, *Partnering with the Community and Business to Deliver Outcomes*, 2009, p57. Available at: http://www.dpc.wa.gov.au/Publications/EconomicAuditReport/Documents/eac_final_report.pdf Accessed on 22 August 2012.

126 Ms Deborah Bevan, Manager E-Schooling at Department of Education, Western Australia, Briefing, 21 August 2012.

Figure5.1-Schooling 2012[127]



e-Schooling is goal oriented. The Department, having established its goals, uses or adapts software applications that will best meet these goals, as opposed to trying to adapt goals to technologies. One such innovation is the trialling of the 'Connect' strategy.

Connect

There are currently large numbers of websites for teachers to navigate on the Department's website which are difficult to access without specific training and are seen as being user unfriendly. As an example there are seven websites on the topic of 'student achievement'. Such complexity is expensive and affects user adoption and retention.

127 Ms Deborah Bevan, Manager E-Schooling at Department of Education, Western Australia, 21 August 2012.

Unsurprisingly,

> *Teachers and students want more than delivery of multiple technology components acting in isolation. They want a seamless and personalised user experience that "just works".*[128]

Therefore, the Department has trialled a web based strategy known as 'Connect'. It started out with seven schools and has expanded the number to twenty over 18 months. There were varying numbers of teachers involved in each school. Some schools only had one class and one teacher – others had three or four teachers.[129]

Connect is not about teaching but about administration for use by teachers, parents and students. It was developed after significant consultation with teachers and parents as to what they would want.

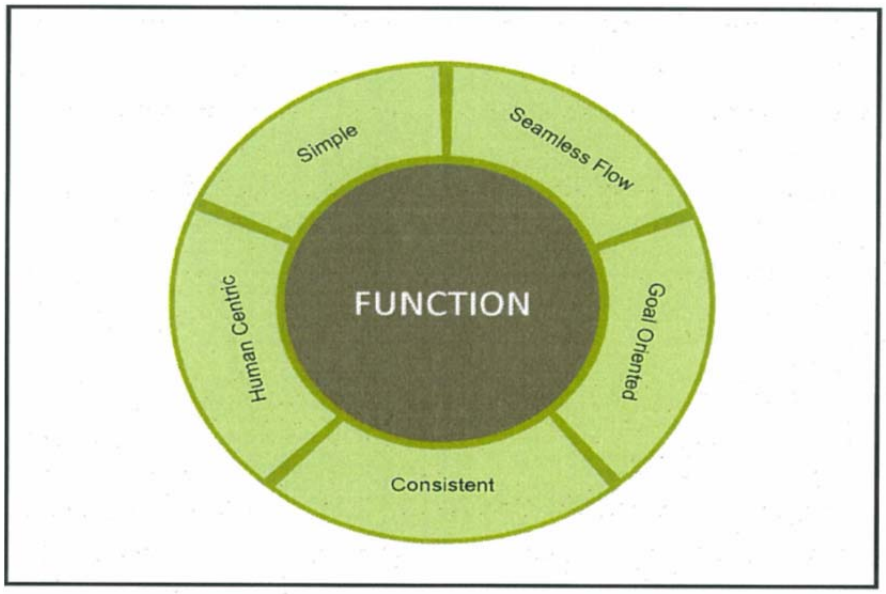
In particular, parents wanted to be able to readily access details of:

- Their child's performance;
- Their child's attendance;
- School announcements;
- Class details – what is happening in the class room generally; and
- The ability to amend their own personal profile.

'Connect' is built in 'open source' software known as 'Liferay'. Liferay is designed for portals, publishing, content, and collaboration. Its functionality is based in five concepts as illustrated in the figure below.

128 Submission No. 15 from Department of Education, November 2011, p2.
129 Deb Bevan, Manager E-Schooling, Electronic Mail, 22 August 2012.

Figure 5.2 The five concepts around Concept[130]



The key concept of the strategy is that it is designed to be human centred. This is seen as being particularly important. It meant that it needed to be interactive, recognise the role of the teacher/student/parent by matching the goals in language appropriate to the stakeholder.

Teachers can communicate to parents through the site, put up photos of classwork, access the Department's account manager, access emails, report to parents, access the student achieving information system and attendance records. In addition Connect allows teachers to:

- Access quality digital teaching and learning resources;
- Create authentic online learning opportunities; and
- Access a variety of online class tools to support learning.

Parents can, at a glance, learn what their child is doing in the classroom, hear direct from the teacher, review ongoing progress of their child and see what periods their child has been absent from.

Students similarly have access to their portal. They see a view similar to their parent and can communicate with their friends:

- through discussions that are controlled by the teacher, but can be initiated by the student if they want;

130 Ms Deborah Bevan, Manager E-Schooling at Department of Education, Western Australia, Briefing 21 August 2012.

- by contributing to the class board that has been set up by the teacher;
- by providing a comment on an announcement that a teacher has made to the whole class;
- by sending an email to another student(s); and
- by commenting on the assignment that the teacher has set up. [131]

As is the case with the decentralised, empowered approach that now informs the Department's ICT strategy and broader culture, Concept can be accessed anywhere, anytime through a personal computer, an Apple/Mac, an iPhone or an iPad.

While at the time of writing the recently undertaken evaluation of this trial is yet to be released, the Committee is given to understand that it shows that the strategy has built engagement between parents and the school and is seen as adding significant value to the classroom.

e-Learning and the Australian Curriculum

The evolution of technology and web based services has been paralleled by the development of a large number of electronic learning objects. These have been created by a range of agencies, interest groups and governments. In the past there has not been a way to connect them to the curriculum, but they are now being consolidated. 'We have had eight separate school curriculums in Australia. One of the interesting things that is happening now is that vast collection of learning objects is now being electronically indexed back to the national curriculum.' [132]

This indexing is being undertaken by Educational Services Australia by way of a project known as 'Australian Curriculum Connect', funded by the Department of Education, Employment and Workplace Relations (DEEWR). Its objective is to link each state's repository and develop a 'technical framework for sharing, discovering and using digital curriculum.'[133]

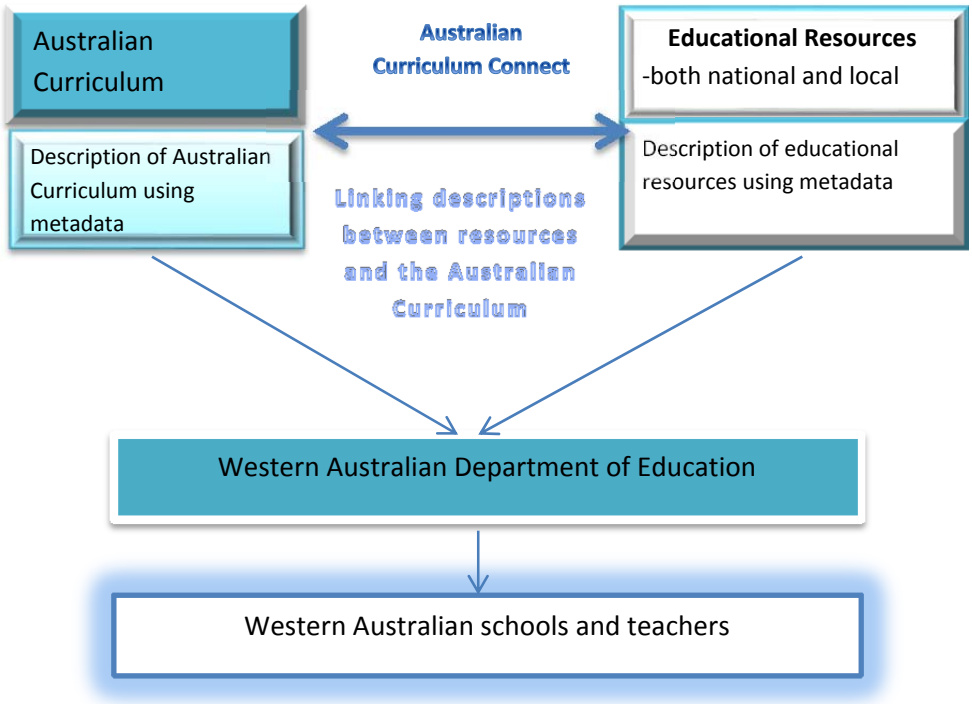
> *The national curriculum is like a skeleton. It is a structure which says: do these things, learn these things in year three in science; learn these things in year 10 in English. But the most interesting thing, particularly for a state like Western Australia, is that now all of the learning resources of all of the states and all of the interest groups that provide*

131 Deb Bevan, Manager E-Schooling, Electronic Mail, 22 August 2012.
132 Professor William Louden, Senior Deputy Vice Chancellor, University of Western Australia, *Transcript of Evidence*, 8 August 2012, p2.
133 Education Services Australia, *Australian Curriculum Connect*, 2012, Available at: http://www.esa.edu.au/projects/australian-curriculum-connect. Accessed on 16 August 2012.

> *learning resources for free can now be properly connected to the skeleton, to the structure.* [134]

A key facet of the Department's 'e-Schooling in 2012' is the development of linkages with 'Australian Curriculum Connect'.

Figure5.3 Australian Curriculum Connect: Connecting curriculum, resources and users online[135]



The increasing speed of internet access has led to greater opportunities for people to use electronic learning, and to access and download material. However, while 'it has been a bit like a shoebox full of photographs, a great big shoebox which you would put your hand into and find something 'about your topic, 'the national curriculum provides a structure to connect all the bits'.[136] The common structure, with its indexing, is one of the virtues of the national curriculum. It allows for a 'sensible search strategy'. Additionally, an outcome of integrating the learning resources of all the states is that

134 Professor William Louden, Senior Deputy Vice Chancellor, University of Western Australia, *Transcript of Evidence*, 8 August 2012, p2.
135 Figure adapted from Education Services Australia, Australian Curriculum Connect, 2012.
136 Professor William Louden, Senior Deputy Vice Chancellor, University of Western Australia, *Transcript of Evidence*, 8 August 2012, p2.

those larger well-resourced states and the smaller less well-resourced states will now have equality of access to the production of content and syllabuses.[137]

Student interface – 'in their hands'[138]

> *There is now a growing body of national and international evidence demonstrating the positive impact of digital technologies on measurable learning outcomes.*[139]

With web based learning and new more flexible technology, there is ongoing debate and experimentation as to how these advances are best used in different sorts of school environments.

Trying to determine the merits of integrating digital technologies into the learning environment and into a teacher's pedagogical practice is fraught with difficulty because of the complexity of the educational process. However, a review of the evidence undertaken by the United Kingdom Department of Education found, amongst other things that:

137 Professor William Louden, Senior Deputy Vice Chancellor, University of Western Australia, *Transcript of Evidence*, 8 August 2012, p2.

138 The Department of Education and Early Childhood Development, *Getting started*, 2012, p1. Available at: http://asp-uk.secure-zone.net/v2/index.jsp?id=639/684/1619&lng=en. Accessed on 27 August 2012.

139 UK Department of Education - BECTA, *The impact of digital technology*, 27 Augusts 2012, Available at: http://www.ictliteracy.info/rf.pdf/impact-digital-tech.pdf. Accessed on 27 August 2012.

- *Classes with online learning, whether completely online or blended, on average produce stronger learning outcomes than learning face-to-face alone.*

- *Young people with a computer at home are less likely to play truant at ages 14 and 16 than those without computer access. For example, having access to a computer at home is associated with a 5.8% reduction in the likelihood of playing truant at age 16.*

- *The use of ICT to support learning at home delivered a range of benefits including motivational and self-confidence effects, particularly for under-achieving learners.*[140]

As technology becomes more broadly accessible and high functioning, students' behaviours are changing.

> *Changes may be relatively mundane, such as replacing the school folder with a memory stick, or more profound, as when learners voluntarily seek out expertise beyond the traditional classroom.* [141]

The Department has an Online Teaching System which is accessible anywhere, by any machine, as outlined in this report. In Western Australia, some schools have integrated the available technology into their pedagogical practice. They will offer online courses where they do not have the student numbers or the resources to run the courses themselves.

In Manea Senior College in Bunbury, students tend to use 'netbooks' rather than lap tops as they are cheaper and lighter. Once they log in they can access both the Department of Education and other sites if they are studying at home.[142]

There were some remarkable stories recounted to the Committee. In one instance a female student who was only on campus for 15% of expected attendance time was able to graduate. She was able to take advantage of the flexibility provided by e-Learning supported by the schools learning-oriented behaviours.[143]

In another instance, ICT was used to engage young people not in education or training:

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140 The Department of Education and Early Childhood Development, *Getting started*, 2012, p1. Available at: http://asp-uk.secure-zone.net/v2/index.jsp?id=639/684/1619&lng=en. Accessed on 27 August 2012.

141 The Department of Education and Early Childhood Development, *Getting started*, 2012, p1. Available at: http://asp-uk.secure-zone.net/v2/index.jsp?id=639/684/1619&lng=en. Accessed on 27 August 2012.

142 Briefing, Manea Senior College, Bunbury, 11 May 2012.

143 Briefing, Manea Senior College, Bunbury, 11 May 2012.

> *The other thing we do for young mums is that we have another online program for kids who cannot get out of the house. We will provide the education online, but then send a chaplain in for two to three hours a week to then chat with the person and bring them out of the home, so that is for kids with things like mental health disabilities. But we actually have two mums in that process. One was actually in DCP care and refused to go to any school.*[144]

In the Pilbara, e-learning is seen by some as the future, given the geographic distances, and low population density. One witness to the Committee noted that there are 8,500 students across the Pilbara of which 2,300 are Aboriginal students. Therefore, in their view 'e-learning will be much more important to the overall outcomes of education in the region than the small percentage of students for whom attendance is an issue.'[145]

i-Labs

When visiting the Centre for Educational Innovation and Technology at the University of Queensland, the Committee was shown an online laboratory (i-Lab). Online laboratories are experimental facilities that can be accessed through the Internet, allowing students and educators to carry out experiments from anywhere at any time. The Committee was able to run a real time experiment using radioactive material in a remote location. As one witness noted:

> *One of the big pluses of the virtual world is virtual laboratories. You can do science experiments, physics experiments and chemistry virtually. Most of astronomy these days is virtual. All you have is a whole lot of data collected by some telescope somewhere in the world, which you never look down the little tube of, of course; it is all done by sensors. A lot of the science and learning and research is virtual.* [146]

i-Labs allow students to undertake experiments that, through a lack of resources, technology, time or geographical distances, they would not otherwise be able to undertake. This is possible because in 2012 most equipment has a computer interface for control and data storage.

An i-Lab:

- Gives science teachers and learners in traditional and online high schools, museums, and informal science education programs the ability to experience

144 Dave Stevens, Principal, Alta-1, *Transcript of Evidence*, 13 June 2012, p10.
145 Briefing Pilbara Education Regional Office, Department of Education, Karratha, 12 March 2012.
146 Dr Ashley Aitken, Senior Lecturer, School of Information Systems, Curtin University, *Transcript of Evidence*, 9 July 2012, p9.

the excitement and authenticity of using high-end equipment to investigate the world in the same way that scientists do;

- Provides new research and learning opportunities for students, allowing them to share and discuss procedures and results;
- Prepares teachers to integrate i-LABs in a range of science courses (including AP courses), encouraging them to go beyond the current paradigm of cookbook science labs with out-dated or inappropriate equipment; and
- Allows access by students and other audiences around the world that might not otherwise have the resources to purchase and operate costly or delicate lab equipment.[147]

e-Learning and literacy – the paradox

Literacy is fundamental to educational outcomes. There is an ongoing debate about the impact of technology on literacy. Abbreviations used in texting, spellcheck and the use of imagery have become the tools of informal communication. Should technology change the way literacy is taught or is it a simply a new tool to be used alongside old methods? For some, such changes are seen as positive enablers, allowing students to present and reconfigure information differently:

> *I think we're in the midst of a literacy revolution the likes of which we haven't seen since Greek civilization; technology isn't killing our ability to write. It's reviving it—and pushing our literacy in bold new directions.*[148]

While recognising that regardless of technology, 'knowledgeable and dedicated teachers are the critical element in successful reading instruction programs'[149] technology can support these teachers and help them be more successful with all children.

> *What this research showed—it was with some groups of upper primary students—was that when they went through a spelling learning program students who did a lot of texting did better on their spelling program. Yes, it is how you use it [technology] that is important. I do not think either using it or not using it is going to mean*

147 I-Lab Central, *About i-Lab Central*, 2012, Available at: http://ilabcentral.org/about.php. Accessed on 28 August 2012.

148 Clive Thompson quoting Professor Andrea Lunsford on the New Literacy, 2009, Available at: http://www.wired.com/techbiz/people/magazine/17-09/st_thompson. Accessed on 29 August 2012.

149 Education Development Center, Inc., *Technology and Teaching Children to Read*, 2004, Available at: http://www.neirtec.org/reading_report/rdgreport.pdf. Accessed on 31 August 2012.

> *necessarily that you get a better set of skills at the end. It is the skill of the teacher in being able to combine it with other things within their teaching and learning programs.*[150]

Additionally, while print-based literacy is a necessary skill, new forms of literacy skills and competencies are required for improved life chances, particularly in the new world of work. Such forms of multimedia literacy make the case that literacy and technology are integrally related.[151]

'Given this, teacher learning and knowledge will need to incorporate and make the connections between written, visual, oral and digital contexts and the overriding social learning environment.' [152] This can be exampled as follows:

From the student's standpoint:

> *Increasingly, we are seeing some emerging, really exciting ways in which engagement in text and forms of reading and writing can be enhanced by technology. IPads as tablet devices are very motivating, interactive, instant feedback providers to students on their progress, a lovely adjunct for a teacher to improve reading and writing literacy.* [153]

From the teacher's perspective:

> *Gaming type technologies are sometimes employed by teachers. Some teachers actually engage students to write the games and in doing so build up some very competent literacy skills through that. Technology is increasingly a part of the way students are being exposed to learning activities and completing learning and the way teachers are preparing those activities.* [154]

150 Dr Christopher Newhouse, Educational Researcher, Edith Cowan University, *Transcript of Evidence*, 9 July 2012, p9.

151 Office for Education Policy and Innovation, Department of Education and Early Childhood Development, *Evidence-based research for expert literacy teaching*, 2007, Available at: http://www.eduweb.vic.gov.au/edulibrary/public/publ/research/publ/literacy-summary-paper.pdf. Accessed on 31 August 2012.

152 Office for Education Policy and Innovation, Department of Education and Early Childhood Development, *Evidence-based research for expert literacy teaching*, 2007, Available at: http://www.eduweb.vic.gov.au/edulibrary/public/publ/research/publ/literacy-summary-paper.pdf. Accessed on 31 August 2012.

153 Ms Deborah Bevan, Manager, e-Schooling, Department of Education, *Transcript of Evidence*, 21 March 2012, p13.

154 Ms Deborah Bevan, Manager, e-Schooling, Department of Education, *Transcript of Evidence*, 21 March 2012, p13.

Finding 14

The greater the skill of the teacher in combining technology with their teaching and learning program the greater the result in better educational outcomes for their students. This includes literacy.

The regions most in need of the benefits of ICT are the regions that are more broadly associated with low NAPLAN scores, with small population areas and significant distances between communities. Unfortunately, it has been repeatedly suggested to the Committee that it is these same regions that are frequently affected by poor connectivity, limiting the benefits of technology in education.

> *The paradox is that the people into the future who could most benefit from online learning, meaning our students in remote schools but also whole school communities, do not have the same quality of access that their peers in the metropolitan area have.*[155]

e-Learning Professional Development

The potential of ICT will not be realised where a school is equipped with new technology without first training the teachers in how to use the equipment in both practical and pedagogic terms.[156] The Department is fully aware of the need for such training if the ICT vision is to succeed.

> *Professional development programs are a critical element of e-learning to tackle teachers' reluctance to use technologies with their students. Too often the champions and early adopters of ICT create a divide in the school with reluctant teachers feeling alienated or afraid to take their first steps into online learning strategies. Professional development programs need to guide the more expert teachers in how to mentor less confident teachers to use ICT purposefully and flexibly to improve student learning outcomes. Coaching programs support teachers to embed ICT into teaching, which is of critical importance in developing students' 21st century competencies and should be grounded in international research with opportunities for formal accreditation.* [157]

However, there is a difference of opinion between the Department and its staff about how accessible such training is and how informed staff are about its availability.

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155 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p13.

156 The challenges facing education and curriculum development at the beginning of the twenty-first century, Available at: http://ralkoofi.wordpress.com/2009/03/21/information-communication-technology/. Accessed on 28 August 2012.

157 Submission No. 15 from Department of Education, November 2011, p2.

The Department advised the Committee that:

> *we have a number of programs, some of which are funded by partnerships with external agencies and some of which are funded through a whole-of-department contract to provide online professional learning to 2,500 teachers a year, and we have been running those for three years. Those programs allow teachers to register for free into a world of courses that they can undertake. They can be self-paced or moderated and they can learn about the basics of using Excel or Word or how to use digital photos and manage them in a classroom situation and how to use the internet effectively and about what search strategies they can give their students. We have online professional learning courses that help them deal with copyright issues and using digital resources effectively, and about students' online policies. These courses are freely available. At any time teachers can enrol in these classes, take them at their own pace and refer back to them. A level of self-paced support is provided.*[158]

Despite this there is anecdotal information that while there is ICT training offered to teachers, it is not universally seen as accessible or relevant.

> *My understanding from most staff is that if you want to have some sort of training, you need to actually seek it out yourself. Even to the extent of the Integris (SIS) program that the department has—that is the one that all the student data goes on—if we get PD in specific areas of that, the school pays a couple of hundred dollars to go to that PD. Then, obviously, if it is in school time, which often it is, they would also have to pay for the relief person as well.* [159]

And

> *I do believe there is some training offered throughout the system. I am not sure if it is handled centrally or not, but then again a lot of it is 'ad hoc'. With the new cluster arrangement where schools are building in an area, clustering together, I think there is a confidence being held by the cluster itself, in that there is a provision of IT PD in there. I do not think that one is handled centrally.*[160]

158 Ms Deborah Bevan, Manager, e-Schooling, Department of Education, *Transcript of Evidence*, 21 March 2012, p15.

159 Ms Joyce Bootsma, School Registrar and Community and Public Sector Union/Civil Service Association of Western Australia representative, *Transcript of Evidence*, 9 July 2012, p10.

160 Mr Russell Clarke, ICT Officer, Community and Public Sector Union/Civil Service Association of Western Australia,, *Transcript of Evidence*, 9 July 2012, p9.

A key training issue identified by international research literature is the importance of teachers' pedagogic beliefs and their alignment with the use of ICT. 'These beliefs and experiences are a more powerful determinant than the ICT skills and confidence of teachers.'[161] Such pedagogic beliefs can be changed through professional development.[162]

A further complicating factor, in terms of providing ICT professional development, is that of the related costs incurred in regional areas. The Committee was told that in the Pilbara there are 550 teachers and that 'it is difficult for teachers in the Pilbara to access professional development, because a ticket to Perth costs $600 - $1,000'. E-learning is seen as a solution in the longer term.[163] The current difficulty with using e-Learning in the regions for professional development is the limitations of the Department's current technology.

> *To have more equitable availability of professional learning across the state will require us to have a greater technological capacity. That is proving to be a challenge.*[164]

ICT is a State and Federal cornerstone strategy for improving educational outcomes. However, because staff and schools can prioritise how they use the limited school grant for professional development, (including ICT), ICT is not necessarily the preferred option. [165] [166]

The Community and Public Sector Union/Civil Service Association of Western Australia argues that there is a need for the establishment of a Department of Education-specific training course through a Registered Training Organisation to train ICT Officers in Department of Education procedures. Such a course 'would provide Officers with a qualification, and ensure that they are trained in Department of Education systems,

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161 Newhouse, P. (2010). School Leadership critical to maximising the impact of ICT on learning Digital Diversity. Conference Proceedings of the Australian Computers in Education Conference 2010, Melbourne 6-9 April. Carlton, Victoria: Australian Council for Computers in Education (ACEC).

162 Education Resources Information Centre, *Changing Teacher's Beliefs through Professional Development.* 1998. Available at: http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?_nfpb=true&_&ERICExtSearch_SearchValue_0=ED422296&ERICExtSearch_SearchType_0=no&accno=ED422296. Accessed on 31 August 2012.

163 Briefing, Pilbara Education Regional Office, Department of Education, Karratha, 12 March 2012.

164 Mr Lindsay Robert Hale, Acting Executive Director, Statewide Planning and Deliver, *Transcript of Evidence*, 21 March 2012, p16.

165 Mr Bevan Doyle, Chief Information Officer, Department of Education, *Transcript of Evidence*, 21 March 2012, p14.

166 Newhouse, P. (2010). School Leadership critical to maximising the impact of ICT on learning Digital Diversity. Conference Proceedings of the Australian Computers in Education Conference 2010, Melbourne 6-9 April. Carlton, Victoria: Australian Council for Computers in Education (ACEC).

processes and procedures. This would form part of a broader structured plan of ICT and supporting eLearning in WA schools.' [167]

Finding 15

The potential of ICT will not be realised where a school is equipped with new technology unless the teachers are trained in how to use it, as part of their approach to student learning. There is currently no coherent mandated strategy to achieve this.

Recommendation 4

The Committee recommends to the Minister for Education that by 2014 the Education Department mandate ICT as part of continuing professional development. ICT should be integrated into the classroom curriculum and aligned with the teacher's approach to student learning.

e-Learning Leadership

> *Developing a culture of e-learning into every classroom requires support for school leaders. This can take the form of providing evaluation frameworks, ICT competency continua, hands-on workshops with mentors and online opportunities such as video casts and podcasts to share ideas. Students can have a role in developing the e-learning culture by being involved in technology committees, decision making and collaboration on the e-Schooling initiatives that are delivered and technology that schools will adopt.* [168]

Barriers to teachers utilising e-Learning in their classrooms

Despite the increasing' take up' of technology in schools and classrooms there remains a body of teachers who, for differing reasons, are reluctant to maximise its use. Several reasons have been suggested including:

- lack of confidence
- tunnel vision; and
- the fear of technology failure.

167 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p5.
168 Submission No. 15 from Department of Education, November 2011, p3.

Lack of confidence

Research has long established that teachers who participate in IT-oriented professional development activities appear likely to increase their use of IT.[169] The Department of Education's submission to this inquiry suggests that in situations where teachers do not incorporate e-Learning into their classrooms it is because the teacher lacks the confidence or the knowledge to do so. This is supported by past studies by the Babson Survey Research Group into online learning which have found a strong positive relationship between exposure to online education and a more positive attitude toward it.[170]

In a survey of 4,564 faculty members it was found that:

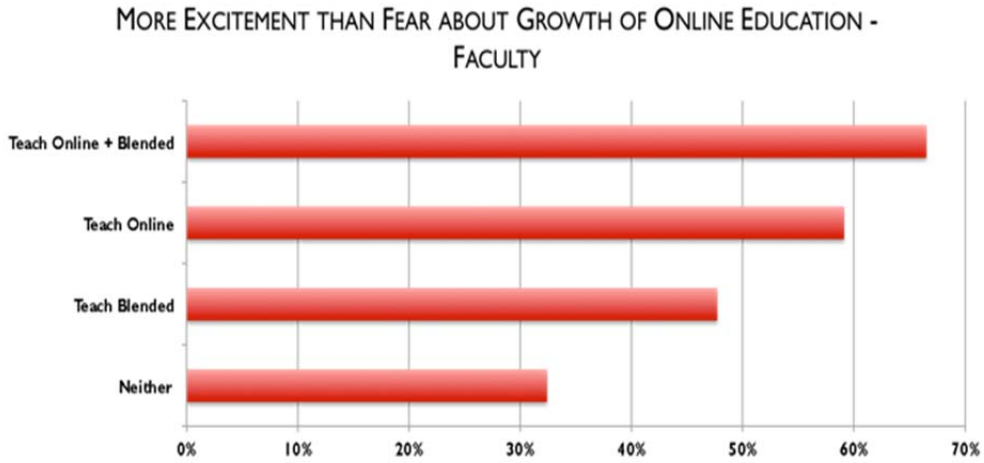
> *Attitudes toward online learning also align with faculty members' own teaching experiences. Professors who are teaching both online and blended courses hold the most favorable view, with two-thirds reporting that they feel more excitement than fear. Those teaching online have a somewhat less positive view, followed by those teaching only blended courses. The faculty members who are not teaching either blended or online courses are more likely to express fear than are faculty members who are teaching online and/or blended courses.*[171]

169 National Science Board, *Information Technology in Schools*, 2004 Available at: http://www.ictliteracy.info/rf.pdf/impact-digital-tech.pdf. Accessed on 3 September 2012.

170 A Joint Project of The Babson Survey Research Group and Inside Higher Ed, *Conflicted: Faculty and Online Education, 2012*, Available at: http://www.insidehighered.com/sites/default/server_files/survey/conflicted.html. Accessed on 28 August 2012.

171 A Joint Project of The Babson Survey Research Group and Inside Higher Ed, *Conflicted: Faculty and Online Education, 2012*, Available at: http://www.insidehighered.com/sites/default/server_files/survey/conflicted.html. Accessed on 28 August 2012.

Figure 5.4 Results from survey of 4,564 faculty members



Tunnel vision

Anecdotally, it was suggested to the Committee that in addition to a lack of experience with technology, there are, in the regions, 'many (teachers) who have been there for years and who tend to get 'tunnel vision'.[172] There is no reason to assume that this is a purely regional phenomenon.

Fear of technology failure

> *There is anecdotal evidence, however, that where teachers do not use eLearning it is not due to a lack of motivation, confidence or knowledge – it is because if the technology fails, there is no ICT Officer at the school who can provide that immediate support. For teachers to use eLearning in their classrooms (and structure their lessons around this technology), they need to have confidence that they can deliver their teaching program without incident, or be able to rely on receiving immediate support if it is required. As noted above, the curriculum server is not supported by the CSC for non-SOE4 schools.*[173]

172 Briefing, Pilbara Education Regional Office, Department of Education, Karratha, 12 March 2012.
173 Submission No. 18 from Community and Public Sector Union/Civil Service Association (CPSU/CSA), March 2012, p4, 5.

Chapter 6

Current and future developments

During the course of this Inquiry, the Committee visited the Centre for Educational Innovation and Technology (CEIT) at the University of Queensland. While there, the CEIT briefed the Committee on a report by the New Media Consortium (NMC). The NMC is an international not-for-profit consortium of learning-focused organizations dedicated to the exploration and use of new media and new technologies.[174]

Each year, the NMC publishes a Horizon Report, which 'charts the landscape of emerging technologies for teaching, learning, research, creative inquiry, and information management'.[175] The NMC Horizon Report: 2012 K-12 Edition[176] provides comprehensive research that identifies and describes emerging technologies likely to have a large impact over the coming five years in education around the globe. This chapter summarises its key findings and includes some third party comment.

Next 12 months

Bring Your Own Device (BYOD) programs

Mobile devices and apps

Mobile devices and apps are increasingly valued as important learning tools in K-12. Once banned from the classroom, mobile devices and apps have become such compelling tools that schools are beginning to rethink standing policies, and some are even beginning to implement 'bring your own device' (BYOD) programs.

> *"Bring your own digital device". You might have seen the acronym floating around. It comes from business where people have ownership of technology and they choose technology that suits them. Rather than everyone having to use this IBM PC or this Mac or whatever, they choose what works with them and it is the use of that as a tool in whatever they are doing. From a teacher's point of view it does not really matter as long as they are comfortable with the technology and*

174 New Media Consortium, www.nmc.org Accessed 4 September 2012.

175 New Media Consortium, *NMC Horizon Project*, http://www.nmc.org/horizon-project. Accessed 4 September 2012.

176 The NMC Horizon Report: 2012 K-12 Edition is a collaboration between the New Media Consortium, the Consortium for School Networking, and the International Society for Technology in Education, Available at: http://www.iste.org/Libraries/Documents/2012-horizon-report_k12.sflb.ashx. Accessed on 30 August 2012.

> *they can see its potential in education, rather than, "We have to train you up on this and next year it will be something else", or whatever.* [177]

BYOD is seen as having a natural momentum in the future of education due to three key factors:

- Tight school budgets;
- The reducing cost of technology;
- The advent of cloud computing; and
- The recognition of the educational potential of such an approach.[178]

The success of BYOD is dependent on everyone having access to the same portal or a Cloud solution. This is the current case with the Department where SOE4 has been rolled out. It depends on teachers seeing this technology as being something that is background. 'You would not go anywhere without a pen; so now you do not go anywhere without some kind of digital device and you do not teach unless you have got one.' [179]

The potential applications of mobiles are vast, and range from graphing complex mathematical equations to storing and sharing notes and e-book annotations. Apps in particular are the fastest growing dimension of the mobile space in the K-12 sector right now, with impacts on virtually every aspect of informal life, and increasingly, potential in almost every academic discipline. Always-connected Internet devices using 3G, 4G, and similar cellular networks, imbedded sensors, cameras and GPS have inspired hundreds of thousands of applications. With a steady flow of new apps that take advantage of the continual stream of enhancements to these tools, as well as key advances in electronic publishing, and the convergence of search technology and location awareness, mobile devices and apps grow more and more interesting with each passing month. [180]

177 Dr Jeremy Pagram, Educational Researcher, Edith Cowan University, *Transcript of Evidence*, 9 July 2012, p3.

178 Digital Learning Environments, *Tools and technologies for effective classrooms*, Available at: http://www.guide2digitallearning.com/. Accessed on 30 August 2012.

179 Dr Jeremy Pagram, Educational Researcher, Edith Cowan University, *Transcript of Evidence*, 9 July 2012, p3.

180 The NMC Horizon Report: 2012 K-12 Edition is a collaboration between the New Media Consortium, the Consortium for School Networking, and the International Society for Technology in Education, Available at: http://www.iste.org/Libraries/Documents/2012-horizon-report_k12.sflb.ashx. Accessed on 30 August 2012.

Tablet computing

Tablet computing presents new opportunities to enhance learning experiences in ways simply not possible with mobile phones, laptops, or desktop computers, and is especially suited for one-to-one learning in the K-12 environment. High-resolution screens allow users of tablets, such as the iPad and Galaxy, to easily share content, images, and video.

Tablets are engaging and viewed as less disruptive than other hand-held devices (no phone ringing and no incoming text messages). Because tablets are able to tap into all the advantages that mobile apps bring to smaller devices but in a larger format, schools are seeing them not just as affordable solutions for one-to-one learning, but as feature-rich tools for all sorts of assignments, often replacing far more expensive and cumbersome devices and equipment.

> *I think digital technology will allow us to create a real model of the knowledge and skills that each learner has. That is a really key thing, so that we know where they are up to. Teachers' roles will now be more, sort of, guide-on-the-side and manager of the learning rather than the primary provider. I see these web-based systems as the future. I see how my children engage with Mathletics and other similar systems. It is like the gamification of education. Gamification is a big thing in industry these days—making all services like games where you are challenged and you achieve skill levels.*[181]

In visit to Roseworth Primary School, Girrawheen, the principal advised that the school board has invested in 100 iPads to enable students to undertake individualised learning. Amongst other things iPads will assist students in 'Dolch sight word'[182] recognition, playing back recorded reading, fluency, and with the GPS 'Geo Caching'[183] which will teach the students longitude and latitude.[184]

Two to three years out

The second adoption horizon, two to three years out, identified in the 4 NMC Horizon Report: 2012 K-12 Edition is where the widespread adoption of two technologies that are experiencing growing interest within K-12 education can be expected: personal learning environments and game-based learning. Educational gaming brings an increasingly credible promise to make learning experiences more engaging for

181 Dr Ashley Aitken, Senior Lecturer, School of Information Systems, Curtin University, *Transcript of Evidence*, 9 July 2012, p3-4.

182 The Dolch sight words list is comprised of 220 words that must be learned in order to master the English language. For the most part, these words can't be taught through pictures and/or phonics.

183 An international high-tech treasure hunting game.

184 Briefing Mr Geoff Metcalf, Principal, Roseworth Primary School, 5 September 2012.

students, while at the same time improving important skills, such as collaboration, creativity, and critical thinking.

Over the past year, the definition of personal learning environments has transcended its original ties and dependence on learning management systems.

Personal learning environments

Personal learning environments (PLEs) have come to refer to any collection of resources and content that students have chosen to use in directing their own learning, at their own pace.

Personal learning environments (PLEs) refer to the personal collections of tools and resources a person assembles to support their own learning — both formal and informal. The conceptual basis for PLEs has shifted significantly in the last year, as smartphones, tablets, and apps have begun to emerge as a compelling alternative to browser-based PLEs and e-portfolios. There has been a corresponding move away from centralised, server-based solutions to distributed and portable ones. Despite the use of the word 'environment' in the name, the notion of a physical or virtual space is somewhat irrelevant to a PLE. The goal is for students to have more control over how they learn in school, just as they do at home, and for teachers to set expectations that their students will be actively engaged in designing and supporting their own learning strategies.

Personal learning environments rely on enabling technologies, especially Cloud Computing and mobile devices, which make the learning environment portable, networked, and personally relevant.

Game-based learning

Game-based learning has gained more traction in recent years as research continues to demonstrate its effectiveness for learning. Games for education span the range from single-player or small-group card and board games all the way to multiplayer online games and alternate reality games. Those at the single-player or small-group end of the spectrum are easy to integrate into the curriculum, and have long been an option in many schools; but the greatest potential of games for learning lies in their ability to foster collaboration and engage students deeply in the process of learning. Currently, the integration of games into K-12 is largely driven by individual educators who are motivated to experiment with gaming at school. There is a small but growing set of organisations that partner with schools to help them design or implement games, but until a way is found to marshal resources more effectively in support of game-based learning, it will remain on the mid-term horizon.

Far-term Horizon

On the far-term horizon, set at four to five years away from widespread adoption, are:

- augmented reality and
- natural user interfaces.

Natural user interfaces make the technology far simpler and easier to use than ever before. Interfaces that react to touch, movement, voice, and even facial expressions are fundamentally changing how people interact with devices — and the expectations of them. These technologies are several years away from mainstream use, but already it is clear that their impact will be significant, despite the lack of well-documented K-12 project examples. The high level of interest and investment in both areas are clear indicators that they are worth following closely.

Augmented reality

Augmented reality (AR) is an intuitive doorway through which data can be easily attached to real world objects, settings, and processes in a way that facilitates a deeper understanding of what is being seen.

AR refers to the layering of information over a view or representation of the normal world. It offers users the ability to access place-based information in ways that are compellingly intuitive. AR brings significant potential to supplement information delivered via computers, mobile devices, video, and even the printed book.

Adding to the experience, most of the current tools do this in ways that the user can control and manipulate in real-time. While AR is much simpler to create and use now than ever before, it is still several years away from widespread adoption in schools, although for informal education, it is already commonplace.

History and science museums use augmented reality in creative ways to show visitors the science behind a phenomenon as it happens, or what a building looked like centuries ago as they view it through the camera on their smartphones or tablets. Although AR is a well-understood technology, and the enabling technologies are readily available, the lack of school-based examples justifies its placement on the far term horizon.

Films like Terminator and Robocop have introduced AR. In addition AR has taken a giant leap with mainstream adoption of personal smartphones and inbuilt webcams. AR is essentially the layering of further data on top of the reality we see. This by definition lends itself to education and offers limitless possibilities for the classroom. AR glasses will be worn by students allowing them to surround themselves in virtual worlds that are relevant and prompted by what they see.

Education will become a much more immersive experience where the world can be tailored for learning. Supplementary educational material will be available everywhere, allowing students to leave the classroom and continue learning everywhere they go.

Natural user interfaces

Natural user interfaces make the technology far simpler and easier to use than ever before. Interfaces that react to touch, movement, voice, and even facial expressions are fundamentally changing how people interact with devices — and the expectations of them.

Natural user interfaces allow computers to respond to gestures, motions of the body, facial expressions, voice, sound, and other environmental cues, and are replacing the keyboard and mouse as the standard for computer/human interaction. The various technologies that enable natural user interfaces are making interactions with computational devices far more intuitive, and often so simple that no instructions are even needed to use them. The device teaches you as you interact with it. From the touchscreens on smartphones and tablets, to the gesture and voice interactions built into the latest gaming systems (Xbox Kinect and Nintendo Wii, for example), to capable virtual assistants like Siri on the iPhone 4S, natural user interfaces enable users to learn by doing and seamlessly convert thought to action. Large multi-touch displays support collaborative work, allowing multiple users to interact with content simultaneously. Natural user interfaces have proven especially beneficial for autistic, blind, deaf, and other special needs students; a great deal of progress has been made by exploring applications in these areas.

AR and Natural user interfaces are several years away from mainstream use, but already it is clear that their impact will be significant, despite the lack of well-documented K-12 project examples. The high level of interest and investment in both areas are clear indicators that they are worth following closely.

New technologies

Eye tracking technology

Eye tracking technology is being refined at great pace allowing devices to understand our visual cues and use that data to alter the user experience. This technology will allow teachers to collect and align data from student eye movement to understand what topics students may be having trouble with, what they enjoy and what they find stimulating. Software can then read this data to tailor course material to students, customising the learning experience. This will lead the way to gaining more accurate statistics on student understanding than is currently available from assessment and quiz based approaches.

3D printing

3D printing can be a difficult concept to grasp as the reality seems futuristic and somewhat impossible. Essentially the process allows a designer to define a 3-dimensional model that can then be printed layer by layer to produce a physical reconstruction. The applications for education could be in a number of disciplines ranging from art and design to science and mathematics. Modelling is an essential part of understanding the world around us and the ability to reconstruct models into tangible objects helps re-enforce theoretical principles and the value of simulation. It is still relatively early days for 3D printing but its growth will spur a number of tangent technologies and careers not yet imagined.

Chapter 7

Learning analytics

Online learning without embedded analytics is like a car without wheels. [185]

Learning analytics (LA)

One of the many advantages of technology that Centre for Educational Innovation and Technology highlighted was in the area of tracking student performance and monitoring their activities in ways that did not call public attention to the individual but facilitated the teacher's capacity to provide support and early intervention. The mechanism is known as learning analytics.

> *LA involves the collection, analysis and reporting of large datasets about learners and their contexts in order to improve learning and the environments in which learning takes place.*[186]

Figure 7.1: Tracking student online activity[187]

185 INSIDE Higher Ed, Technology and the Completion Agenda, 2010, Available at: http://www.insidehighered.com/news/2010/11/09/completion. Accessed on 21 August 2012.

186 Open University Innovation Report 1, I*nnovating pedagogy 2012*, 2012. Available at: http://www.open.ac.uk/blogs/innovating. Accessed on 3 September 2012.

187 Hack education, *Learning Analytics: Lots of Education Data... Now What?* 2012, Available at: http://hackeducation.com/2012/05/04/learning-analytics-lak12/. Accessed on 21 August 2012.

While LA is still an emerging technology, it can indicate both how engaged and how much students have learned.

A key to its successful use is the ability to translate that data into actionable insights.

> *It may be impossible to track how much a student really absorbed from one lesson but the system can track his/her behaviour and use that as a signal. Here are a few examples of behavioural signals:*
>
> *- Language of frustration in any media.*
> *- Low time on site, relative to the class.*
> *- Long lag between logins.*
> *- Tracking areas of studies in which the student is weak in over years.*
> *- Detecting the TYPE of mistakes that was made – careless or a fundamental lack of understanding?*
> *- Theoretically, learning analytics would even be able to track whether or not a student is guessing in a multiple choice test.*[188]

The interest among higher education institutions in analytics has grown since early projects impacting student success were highlighted by research published in 2007 in an article 'Academic Analytics'. [189]

Analytics is increasingly possible as a tool for reviewing a student's research and study pathways with the advent of Cloud technology. This places the student in a browser environment.

The Cape York Australian Aboriginal Academy uses analytics with its data driven Direct Instruction and advises that it is a key to the success of the strategy.

LA has the specific goal of improving learning outcomes. Analytics allows educators to identify at-risk students and intervene, improving the chances for student success. Analytics may be used for course improvement, as well.

LA collects and analyses the 'digital breadcrumbs' that students leave as they interact with various computer systems to look for correlations between those activities and

188 Edudemic, *Grades 2.0: How Learning Analytics Are Changing The Teacher's Role*, 3 September 2012, Available at: http://edudemic.com/2012/04/grades-2-0-how-learning-analytics-are-changing-the-teachers-role/. Accessed on 3 September 2012.

189 Educause, *Chapter 4: From Metrics to Analytics, Reporting to Action: Analytics' Role in Changing the Learning Environment*, 2012, Available at: http://www.educause.edu/library/resources/chapter-4-metrics-analytics-reporting-action-analytics%E2%80%99-role-changing-learning-environment. Accessed on 3 September 2012.

learning outcomes. LA displays when students access material online or the results of assessments from students' exercises and activities conducted online. Learning analytics can track far more data than teachers can on their own.

> *Analytics can track and predict student performance, providing alerts to students when their patterns indicate they are at risk of poor performance. In other cases, faculty or advisors are alerted to potential problems, allowing them to intervene and provide specific types of assistance to students.*
>
> *Online learning without embedded analytics is like a car without wheels. Embedded analytics turns online learning into an engine for scaling access and improving retention, persistence, and completion.*[190]

Simple analytics is used by many universities:

> *One of the things we do at university is, when students have been working for four weeks on an assignment, I can go and look in their Google Doc and see that they just started last night or this is what they did three weeks ago and I can tell how they have been working on it. It is great to detect plagiarism too, because plagiarism is usually a copy and paste the whole thing in at once. You can see that sort of stuff.*[191]

LA is still in its infancy because:

> *However, unlike face- to-face classes, teachers have difficulty in monitoring their learners in an online environment, since a lot of learning management systems provide faculty with student tracking data in a poor tabular format that is difficult to understand. In order to overcome this drawback, a novel graphical educational monitoring tool based on faceted browsing that helps instructors to gain an insight into their classrooms' performance. Moreover, this tool depicts information of each individual student by using a data portrait. Thanks to this monitoring tool, teachers can, on the one hand, track their students during the teaching-learning process and, on the other, detect potential problems in time.*[192]

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190 INSIDE Higher Ed, Technology and the Completion Agenda, 2010, Available at: http://www.insidehighered.com/news/2010/11/09/completion. Accessed on 21 August 2012.

191 Dr Ashley Aitken, Senior Lecturer, School of Information Systems, Curtin University, *Transcript of Evidence*, 9 July 2012, p12.

192 Carlos Monzo,David García-Solórzano,Eugènia Santamaría,Germán Cobo,Javier Melenchón,Jose Antonio Morán, *Educational Monitoring Tool Based on Faceted Browsing and Data Portraits*, 2012, p1. Available at: http://lak12.sites.olt.ubc.ca/program/conference-program/. Accessed on 21 August 2012.

Finding 16

Learning Analytics will play an increasingly important role in improving student educational outcomes, as online learning becomes a normalised part of the education process. Currently, Learning Analytics usage is hampered by unfamiliarity and poor data tabulation.

Recommendation 5

The Committee recommends that the Minister direct the Department of Education to investigate and report back to the Minister by December 2013 on the use and application of student learning analytics to assist teachers and students.

Chapter 8

A case for connectivity

We live in a 'connected' world where information is always accessible; learning is no longer bound by classrooms, libraries, or even instructors. Online tools make resources available to learners everywhere.

A scenario

ICT has reshaped how people learn and connect. People today are connecting to a global learning network in a manner that was previously inconceivable.

> *My son turned 13 a couple of days ago, and it was his rite of passage to get a Facebook account. It is the age they allow you to do it. {my advice is} "Have your Facebook account for your social life and you can do anything you want there, but use LinkedIn for your professional career." This is where you build your CV for the twenty-first century. A lot of employers these days do not ask for a CV; they say "Connect with me on LinkedIn so I can see your history; this is your CV."* [193]

In this 'connected' world where information is always accessible, learning is no longer bound by classrooms, libraries, or even instructors. Online tools make resources available to learners everywhere. Open-source learning can reach thousands of learners in non-traditional ways.[194]

The following case scenario was provided by the Centre for Educational Innovation and Technology (CEIT), Queensland to illustrate the changing face of education tomorrow.[195]

Late for the bus again Fiona was cutting it fine as she always did. Not a morning person Fiona settled in at the back of the bus with her tablet that she had received the previous Christmas. Two assignments were due this week and there was some preparatory maths work that needed to be completed before period 3. Since the bus company now provided free Wi-Fi Fiona could access her files from her Dropbox account and have direct access to the web. Fiona usually sat next to her friend Tranh for the forty minute

193 Dr Ashley Aitken, Senior Lecturer, School of Information Systems, Curtin University, *Transcript of Evidence*, 9 July 2012, p7.

194 EDUCAUSE, *Game Changers: Education and Information Technologies*, report prepared by Oblinger, D. EDUCAUSE, 2012, p1.

195 Briefing by the Centre for Educational Innovation and Technology (CEIT), University of Queensland, Brisbane, 5 July 2012.

ride which consisted of a last minute rush to complete the set work and submit it electronically before class. Facebook browsing tended to interrupt this process but the nice thing was a common login that allowed Fiona to use the same authorisation for both.

Tranh was much better organised than Fiona and had completed the pre class algebra work on the Khan academy site the night before Including a quiz and her reflection on how she coped with the content. The great thing about this "flipped classroom" was that Tranh could work at her own pace within a tailored program designed by Mr Tucker the maths teacher as part of Tranh's personal learning environment. The big plus for Mr Tucker was that he could focus in class on the problem areas as exposed by the quiz and the semantlcaly analysed reflection. He also could see the "real time" class dashboard of individual student profiles combined with the overall class progress while the Head of Teaching and Learning had access to the same information not only for his class, but for the others at school all at the click of a button. Reporting objective information to higher authorities was not a problem anymore and parent teacher evenings focussed on the future not the past.

When Fiona and Tranh entered the school gate their wireless connection seamlessly flipped to the school network with the updated notifications on the tablet and smart phone showing that period 5 had changed classrooms and a new deadline had been given for the geography assignment.

Fiona's English class that morning started with a Skype call on the big screen from a visiting actor appearing at the Melbourne Comedy Festival. The class activity was to break into groups and develop and record a short skit using the HD video camera on their smartphones. For the week's assignment the video then had to be uploaded to critique other group contributions using a set of predefined criteria. Fiona was pretty pleased with her group video so she sent the web link to her mum while walking between classes. Popping a tag on the video she shared it with her online portfolio she had just started developing on her WordPress blog site. She was hoping she could use this video to get a position for work experience at the local community theatre over the summer break.

In the staffroom Elaine, a chemistry teacher, was preparing for her session that afternoon with the remote high school she was paired with. The remote school could not justify a specialist chemistry teacher but had good facilities for practical classes. Elaine had developed a pretty good relationship with the remote year 12 class and with local supervision and a good wireless connection, she had become a dab hand at running the two classes simultaneously. Elaine also made short visits to the remote school to run the same classes back to her metropolitan base. They all enjoyed the exchanges.

Tranh's immersive history class in period 4 was focussing on the role of the miners in the Eureka Rebellion. It was Tranh's turn to prepare the historical background which was already up on the class blog and created as an eBook and she had worked with her group members to prepare a digital recreation of the stockade that was projected onto the classroom walls. You felt like you were there. These immersive sessions were always fun and you never knew what the students would prepare to create the atmosphere.

Down in the just finished school learning resource centre, Jane, a biology teacher and Ian a physical education teacher, were looking at some of the ways augmented realty could be used in the classroom or on the sports field. Jane had been trying to find a way for her students to prepare an environmental survey in the field using their own smart phones while Ian was playing with an app called Coach's Eye that might enable him to film his promising high jump team in action and then together critique their technique.

Over in the science department Rachel was preparing the students for a remote laboratory physics experiment that was located at North Western University in the States. Since the experiment was focussed on radiation it could not be done in class without the appropriate safety equipment and it was too expensive for a single school to run. The lesson plan required students to determine the intensity of radiation as a function of distance from the source which meant designing and running the experiment online for homework and then using class time to work in groups to analyse and compare the results from all the experiments.

Back in the staff common room Elaine noticed an alerting flag had popped up on her class dashboard to show one of the remote students had not submitted any work all week and she was not registered as off sick. She made a mental note to follow that up as she closed the lid of her laptop and popped it in her bag. That's enough for one day.

On the bus back home Fiona checked her Facebook posts while Tranh followed up on a tweet about a new version of a location based game she played on the ActivTable her dad had just bought. She was hoping she could use this. It was a toss-up between fighting her brother for the console or flopping on her bed with a 'real' book. The book sounded good.

Appendix One

Inquiry Terms of Reference

1. Current and future resourcing of new methods and activities to improve educational outcomes such as e-learning and school partnerships;

2. Factors influencing positive or negative childhood development from birth to year 12;

3. Facilitating greater opportunities to engage all students in year 11 and 12;

4. Improving access and opportunities for adult learning in regional and remote WA; and

5. Foetal Alcohol Syndrome: prevalence, prevention, identification, funding and treatment to improve education, social and economic outcomes.

The Committee will report by 30 November 2012:

Appendix Two

Committee's functions and powers

The functions of the Committee are to review and report to the Assembly on:

a) the outcomes and administration of the departments within the Committee's portfolio responsibilities;

b) annual reports of government departments laid on the Table of the House;

c) the adequacy of legislation and regulations within its jurisdiction; and

d) any matters referred to it by the Assembly including a bill, motion, petition, vote or expenditure, other financial matter, report or paper.

At the commencement of each Parliament and as often thereafter as the Speaker considers necessary, the Speaker will determine and table a schedule showing the portfolio responsibilities for each committee. Annual reports of government departments and authorities tabled in the Assembly will stand referred to the relevant committee for any inquiry the committee may make.

Whenever a committee receives or determines for itself fresh or amended terms of reference, the committee will forward them to each standing and select committee of the Assembly and Joint Committee of the Assembly and Council. The Speaker will announce them in the Assembly at the next opportunity and arrange for them to be placed on the notice boards of the Assembly.

Appendix Three

Submissions received relevant to this Report

Organisation	Date
Disability Services Commission	December 2011
Stephen Loosely	December 2011
Department of Training and Workforce Development	December 2011
Department of Education	December 2011
Community and Public Sector Union / Civil service Association WA	March 2012

Appendix Four

Hearings and Briefings relevant to this Report

Hearings

Date	Name	Position	Organisation
21 March 2012	Mr Bevan Doyle	CIO	Department of Education
21 March 2012	Mr Lindsay Hale	A/executive Director Statewide Planning and Delivery	Department of Education
21 March 2012	Ms Deborah Bevan	Manager e Schooling	Department of Education
9 May 2012	Ms Sharyn O'Neill	Director General	Department of Education
	Mr Bevan Doyle	CIO	Department of Education
9 July 2012	Mrs Joyce Bootsma	School Registrar	Department of Education
9 July 2012	Ms Rikki Hendon	Branch Assistant Secretary	CUPSA/CSA
9 July 2012	Mr Russell Clark	ICT Officer	CPSU/CSA
9 July 2012	Dr Jeremy Pagram	University lecturer	Edith Cowan University
9 July 2012	Dr Paul Newhouse	Education Research	Edith Cowan University
9 July 2012	Dr Ashley Aitken	Senior lecturer	Curtin University

Briefings

Date	Name	Position	Organisation
11 May 2012	Mr Paul Mathews and Mr Rod Rykers	Principal and Associate Principal:	Manea Senior College
5 July 2012	Dr Alan Cody, ,	Senior eResearch Fellow & Deputy Vice Chancellor (Academic)	Centre for Educational Innovation and Technology
5 July 2012	Prof. Mick McManus, and Prof. Phil Long		Centre for Educational Innovation and Technology

13 August 2012	Mr Bevan Doyle	CIO	Department of Education
21 August 2012	Ms Deborah Bevan	Manager e Schooling	Department of Education
22 August 2012.	Mr Glenn Venn	Director Infrastructure and Telecommunications	Department of Education
5 September 2012	Mr Geoff Metcalf	Principal	Roseworth Primary School

Appendix Five

Glossary

Term	Definition
Cloud Computing	Cloud Computing is a general term for anything that involves delivering hosted services over the Internet.
e-Learning	Education via the Internet, network, or standalone computer. e-Learning is essentially the network-enabled transfer of skills and knowledge. e-Learning refers to using electronic applications and processes to learn. e-Learning applications and processes include Web-based learning, computer-based learning, virtual classrooms and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM.[196]
Hardware	In information technology, hardware is the physical aspect of computers, telecommunications, and other devices.
Information Communications Technology	ICT covers any product that will store, retrieve, manipulate, transmit or receive information electronically in a digital form.
Learning analytics	Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs.[197]
Software	Computer instructions or data. Anything that can be stored electronically is software. [198]

196 Webopedia, *e-learning* Available at: http://www.webopedia.com/TERM/E/e_learning.html. Accessed on 20 August 2012.

197 1st International Conference on Learning Analytics and Knowledge, Banff, Alberta, February 27–March 1, 2011.

198 Webopedia, *software* Available at: http://www.webopedia.com/TERM/S/software.htmlAccessed on 20 August 2012.

Standard operating environment	A Standard Operating Environment (SOE) refers to a given computer operating system (OS) and its associated hardware and software applications, used by an organisation to cost-effectively and efficiently deploy these with custom configurations as required.[199]

199 Techopedia, Standard Operating Environment (SOE). Available at: http://www.techopedia.com/definition/4544/standard-operating-environment-soe. Accessed on 29 August 2012.

Appendix Six

Abbreviations

AR	Augmented Reality
CSC	Customer Service Centre
ICT	Information Communications Technology
IT	Information Technology
K-12	Kindergarten to Year 12
LA	Learning Analytics
LWICT	Learning with Information Communications Technology
NAPLAN	National Assessment Program – Literacy and Numeracy
NOS	Network Operating System
PC	Personal Computer
PLE	Personal Learning Environment
SIDE	School of Isolated and Distance Education
SOE	Standard Operating Environment
TPSA	Technology in Public Schools Alliance
WA	Western Australia