



Department of Education and Children's Services
South Australia

and

Grant High School



Educating for Excellence

What place does open source software have in
Australian And New Zealand schools' and jurisdictions'
ICT portfolios?

Report of the trial of open source software conducted
at
Grant High School
South Australia

June 2004

Prepared by
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This report summaries the findings from a trial by Grant High School concerning aspects of the use of open source software conducted within the school. This report is one of a series produced through this research which includes the following:

- Review of the technical documentation accompanying open source software; and
- A research paper looking at total cost of ownership and open source software in schools.

Each paper presents a perspective to answering the research question. While these reports are self-contained and can be read individually, it is also intended that they be complementary to each other.

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Participation in this research project was conducted at Grant High School with the support of the staff at the school and in particular the following key people in the school:

Mr Wayne Johnson	Principal
Mr Samps Okholm	IT technician
Mr Peter Ruwoldt	ICT Coordinator

This report has been prepared by Dr Kathryn Moyle (Department of Education and Children's Services (SA)) in collaboration with Mr Peter Ruwoldt (Grant High School). Research assistance was provided by Ms Jenny Verner, Research Officer, Department of Education and Children's Services.

Abbreviations

DECS (SA)	Department of Education and Children's Services (South Australia)
DEST	Department of Education, Science and Training
DET (VIC)	Department of Education and Training (Victoria)
ICT	Information and Communication Technologies
MCEETYA	Ministerial Council on Education, Employment, Training and Youth Affairs
TCO	Total Cost of Ownership



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Introduction

Grant High School in Mount Gambier is a public school in the Department of Education and Children's Services (DECS) in South Australia. This school is currently migrating from networked desktops used by students and staff to terminal services, and is reducing the school's level of dependency upon proprietary software. This trial at Grant High School has formed part of broader processes being undertaken within the school where staff have been investigating specific aspects concerning the deployment of open source software with support from DECS (SA). In particular, the following two research projects have been conducted at Grant High School with support from DECS (SA):

- Investigating the impact and constraints of open source software; and
- the development and deployment of a turn-key Linux domain controller.¹

The focus of this trial has been on the use of open source operating systems and applications software to support teaching and learning. It is acknowledged that the ICT requirements in the administrative area of a school are important, however the 'core business' of schools is teaching and learning. While the ICT requirements for the school administration are reasonably defined and limited, the number of desktops and wider range of software available for teaching and learning purposes tends to be the more complex. It is for these same reasons though, that there is also greater room for innovation with ICT used for teaching and learning purposes. This trial then, has focused on the infrastructure and curriculum use of open source software at this school.

The research and trialing work being undertaken at Grant High School is consistent with investigative work being undertaken both within DECS (SA) and at a whole of government level within South Australia. An across South Australian government inter-agency Open Source Software Reference Group has been established following recommendations by the South Australian across agencies CIO Forum. The inter-agency Open Source Software Reference Group has been established to provide high-level guidance and advice to the South Australian government on open source trends and to examine in more detail the use and applicability of open source software at the government agency level. Outcomes from the research and trialing at Grant High School will be fed into this interagency open source group.

Research method

A whole school approach using action research was used to trial the use of open source software at Grant High School. The purpose of the trial was to undertake research and development by trialing uses to which open source software can be deployed in a school environment. The trial focused on investigating:

- the use of open source software at both the front and back ends, on the curriculum side of the IT infrastructure of the school;
- the approach to migration to open source software used at Grant High School;
- teachers' and students' use of open source software for curriculum purposes; and
- school-based issues concerning total cost of ownership.

Each of these strategies have been tracked through the trial.

Outcomes of the trial are intended to inform policy and practice at Grant High School and to provide insights into what may be standard operating environments for schools in DECS (SA).

The following table summarises steps taken in the trial to collect, analyse and interpret data.

¹ Summaries of these research-based trials are available from <http://www.tsof.edu.au/projects/plict/grants.asp>



Table One: Research steps

When (2004)	What	Why
20 February	School assembly held	To introduce the trial and provide information about open source software.
4 March	Newsletter article and article in the Mount Gambier newspaper, <i>The Border Watch</i> about open source software at Grant High School	To raise awareness with parents and the local community about the research and trials being undertaken concerning open source software at Grant High School.
4-31 March	127 new student computers arrived. Mass ghosting of new computers with both Microsoft and open source software and computer roll-out	To provide students and teachers with the choice of using both proprietary and open source software
22 March	Open Office CD rollout: all students and staff provided with a CD of OpenOffice for home and school use.	To enable data to be collected about the school community's views about using both proprietary and open source software.
May18-19	Research conversations were conducted with the school leadership, students, staff and parents about the use of open source software.	To enable data collection from a cross-section of the school community about using open source software, and for this information to fed back to the school community.
May 20 - 31	Reports prepared and data analysed	To provide the basis for reflection and further planning.

These processes were iterative and were undertaken to enable the data collected about the use of open source software to be used to inform future work at the school and by DECS (SA).

School context

Grant High School is a secondary school located in a large country region. It has a student fulltime equivalent (FTE) enrolment of 770 students, 67 FTE teaching staff and 21 student support officers. Students living in poverty make up 30% of the student enrolment; 1% of the student cohort are Aboriginal and 15% of the students have identified special needs. The philosophy of the ICT team is to empower and educate students and teachers.

The school runs two local area networks (LANS): one for curriculum purposes and one for administration. The school experiences 'brown outs' and 'black outs' to the electricity supply about once a week and so the power supply is protected by uninterruptible power units.

Grant High School is aiming to improve the access to computers for students as quickly as possible. Currently the computer to student ratio is one computer per 3.4 students. The school is focusing on increasing this access to computers with a limited range of commonly used programs and will then increase the number and diversity of programs available to students. The aim at the school is to make this increase to the number and diversity of software programs available to staff and students using open source software.

Approach to trialing and software testing

Trialing of all new software at Grant High School occurs in a private online space before deployment to students and staff.

The ICT team has the following attitude to software testing and trialing:



- Research provides the ICT Team with the opportunity to trial and ‘play’ with new concepts;
- Being part of team is important;
- Nothing is too difficult;
- They are willing to learn;
- They are willing to problem solve;
- Job satisfaction is important and so doing work that is intellectually stimulating is therefore, also important to them;
- They always ask ‘*what’s the risk*’; ‘*can you get your data out?*’; ‘*can you migrate?*’

Budget

Schools in DECS (SA) operate under local school management budget arrangements. The school is required to manage within a global budget that comprises an allocation received from central office and is supplemented with additional funds gathered from successful grant applications and from fund-raising in the local community. The base-level funding available to the school is set according to a central office formula. This formula does not include any specified funding component for IT technical support hours or funding allocations for the planned, recurrent turnover or purchase of hardware or software. It is up to the school to determine whether ICT is a priority and to determine the level of funding to be allocated from within the school’s global budget that justifies the identified level of priority.

The Grant High School ICT budget is planned and approved over a three-year cycle, with school approval processes locking in these triennial budgets. The ICT Coordinator has a base-line three-year budget of \$180,000 averaged as an annual budget of \$60,000. The triennial nature of the budget means the ICT Coordinator can plan and save for large cost items during the funding period. The budget covers all ICT infrastructure requirements excluding salaries, which are funded from within the school’s global budget; and professional development and subject specific software, which are funded by individual faculties within the school.

Grant High School has been provided with \$10,000 in 2004 from central office to purchase hardware only. This grant is part of a set of ‘one-off’ grants provided to schools. Central office grants specifically for ICT purchases have been allocated as annual grants until 2006, and so the recurrent costs for handling ICT demands in this school are largely dependent upon the amount of funding the school is able to allocate from within the local budget resources received through global budget allocations and school fund-raising.

School ICT Context

Grant High School has identified ICT as a priority. The school has a large and complex ICT infrastructure that utilises both proprietary and open source software. There are many reasons why the school is aiming to reduce its dependency on proprietary software and is moving to increase its’ use of open source software. These reasons include the following:

- the ICT Team within the school wants to stretch the ICT budget as far as possible;
- the school recognises the international trend toward the use of open source software and wants its’ students to be able to capitalise on this trend;
- the school identifies congruence between the philosophy underpinning open source software and the aims of the school;
- teachers at the school are attracted to the open source software/public good arguments concerning the licence costs of proprietary vs open source software;
- the school is aiming to reduce the current computer to student ratio while not increasing the level of IT labour support required;
- as a duty of care, the school wishes to reduce the risk of students using pirated software;
- the ICT Team wishes to reduce the management of multiple software licences and maintenance agreements and wishes to reduce the extent of these while also increasing the range of software available for use by students; and
- the school is seeking software solutions that enable longer life to be gained from hardware.



Along with introducing the use of open source software, the school is reducing its computer to student ratio by minimising its per unit hardware costs for both desktops and servers. They are doing this by purchasing recycled computers and using these with carefully selected open source software to run them. The necessity for expertise to trouble-shoot and problem-solve when deploying open source software is recognised by the school leadership, and structures have been put in place at Grant to support continuous improvement of the skills and expertise required in open source software at the school.

Migration strategy²

Migration away from proprietary software represents a 'whole school change' at Grant High School. Migrating servers to open source operating systems software is being undertaken 'invisibly': without the staff or students noticing the changes. At Grant High School though, deploying open source software applications on the desktop offers the largest cost savings.³

The following principles are being used to inform the migration strategies at the school. The school is:

- Developing a clear understanding of the reasons why to migrate;
- Ensuring there is active support for the change from the leadership in the school, the staff, students and the school community;
- Building up expertise within the staff and students at the school;
- Developing relationships with others within DECS (SA) and with schools across both the public and private sectors who are also investigating and using open source software;
- Developing relationships with the broader open source communities;
- Ensuring each step in the migration process is tested and manageable; and
- Taking the opportunity to improve the IT systems at the school.

Questions being addressed at the school include:

- how to ensure the interoperability of systems;
- how to support mobile users;
- how to securely identify both local and remote users; and
- how to build systems that are manageable within their budget and staff allocations and skill profile.

Computer hardware deployment

The school has 240 desktops. The administration team has 18 desktops and 222 are deployed for use by students and staff as follows:

- Four computer labs, one with 30 computers and three with 25 computers in each;
- Clusters of 15 computers are deployed on the senior and junior floors respectively;
- Clusters of computers are deployed in the Maths (8), Science (12) and Art areas (8);
- There are 20 computers in the library;
- There is at least one computer in every classroom outside of the main building; and
- At least one computer in every office space for teacher use.

The school has access to a computer recycling company and until recently had been receiving computers through the state government's computer recycling scheme. Most servers and desktops are purchased second-hand from government agencies in the local area and from local businesses. The cost for a standard student desktop is \$300.00. At this price, the school is able to think about these computers as a disposable product.

² See netproject (2003) The IDA Open Source Migration Guidelines, <http://europa.eu.int/ISPO/ida/export/files/en/1618.pdf>

³ See the research paper looking at total cost of ownership and open source software in schools that accompanies this report.



The school has 14 servers for curriculum purposes. The following hardware is used for these:

- IBM PC 300PL
- AthlonXP 1800+
- Dual Athlon
- Dual Athlon 1700
- K6-500
- Dual IntelPIII/933
- Athlon XP 1600+

This range of servers is used for web servers, proxy servers, domain controllers, LAN management, print servers, library servers, terminal services, remote access servers, and back-up. The servers are connected to the LAN either via 3COM switches or equivalent Netgear switches. These servers are also recycled hardware.

All servers are located in one room which is secure and airconditioned.

Terminal services have been put into the school for student use to:

- Reduce the amount of vandalism;
- Reduce the number of moving parts in the computers;
- Reduce the amount of technical support required to maintain the computers;
- Enable increased student to computer ratios; and
- Elongate the life of the computers.

Software deployment

The school uses both Microsoft and open source software. DECS (SA) has a three year Microsoft Schools and Campus Agreement licence which covers the following software upgrades for schools:

- Desktop operating systems: Windows '95 to Windows XP
- Office suite (any version from Office 97 to Office 2003):
 - Word
 - Excel
 - Powerpoint
 - Frontpage
 - Outlook
 - Explorer
 - Access
 - Publisher
 - Visual Studio
 - Encarta
 - Step-by-step guides

The school is required to pay about \$4000 per annum to central office as a contribution to the total cost for the Microsoft Schools and Campus Agreement department-wide licence. This contribution is calculated on a per student basis.

Client Access Licences are purchased at a jurisdictional level for use across the agency. Licences are provided within the Microsoft Schools and Campus Agreement for Windows Server, Exchange, SMS, MS portal server, and SQL server. Schools can also buy licences for products which are available as perpetual licences under Academic Select agreements. The Department also has a department-wide licence for virus software through McAfee.

Grant High School uses Windows 2000 Professional and MS Office 2000 on the front end of all the 222 'curriculum' desktops. Open source software is being investigated in part because it is not possible to deploy bootable images on Windows. OpenOffice is available on the desktops and all students and staff have been issued with a copy of OpenOffice to install at home so that they can use the same software both at home and at school for minimal cost to the school community.

The operating system software being used on the curriculum servers is as follows:

- 4 x SME Servers (based on Red Hat 7)
- 2 x Fedora
- 1 x RedHat 8.
- 1 Windows 2003 server operating systems
- 5 Windows 2000 server operating systems
- 1 Windows XP desktop operating system



The open source server software is upgraded only to improve the system, not because there is a new release. This keeps the system stable, reliable and robust. Apart from the XP desktop operating system, the MS server software is not covered under the jurisdiction's Microsoft Schools and Campus Agreement which means that the school purchases these licences under the Academic Select Agreement and manages these licences locally. Individual faculties purchase or acquire subject specific software that is both proprietary and open source. The school uses a wide range of open source and proprietary software including Gimp, Audacity, WinZip; Adobe and Macromedia products. Managing the number of software site and seat licences and maintenance agreements is a complex and time-consuming task for the school.

Internet browsing is available through either MS IE6; Mozilla or Opera.
A summary of the server hardware and software specifications and costs at Grant High School is included in Appendix One.

Storage of data

Students are provided with 40Mbs and teachers are provided with 250Mbs of server space that is backed up regularly, first to file and then to tape. The school uses three generations of file backup because they can get back to files without having to go to tape and this lessens the support requirements and costs.

ICT support

Over the past 5 years the number of computers in the school have quadrupled but staff numbers for maintaining and supporting their use have not increased nor has the budget to maintain them. The school is able to afford in-school technical support (level 3) for 25 hours per week and in-school technical support (level 2) for 24 hours a week. The ICT Coordinator teaches one line less than other coordinators in the school. The school also provides training through Aries A+ for computer technicians, which costs \$2000 per year, per person. These trainees also contribute to the support and maintenance of the IT infrastructure of the school.

All desktops are re-imaged on a weekly basis.

The technical support is used for the following:

- Curriculum Support
- Teaching of ICT skills
- Network maintenance
- Administrative functions.

Teachers are able to change passwords of students.

A centrally-funded regional technical support officer provides support for administrative functions of the school on request; this officer does not officially provide technical support for the technologies associated with the 'curriculum' LAN or in the teaching of ICT skills. If the school requires outside technical support for 'curriculum' functions, then this support is at the cost of the school.

The school recognises the importance of having well-trained IT technicians and places considerable emphasis on maintaining its' current expertise.



Bandwidth

The available bandwidth at the school is 100mbps internally with two ISDN lines of 128kbps each. One of these ISDN lines is for curriculum use and the other is for administration. Increases in bandwidth provided centrally are anticipated during the second half of 2004.

Grant High School has a main communication cabinet centrally located in the main building, and six other communication hubs, with five connected by fibre, and one connected by Cat5.

This trial did not interfere with how the router is programmed but the IT team want to look at putting a server on the school side of the router to enable accessibility to the outside world.

Grant High School is in the experimental phase using a web server. The school's intranet currently is not delivered via the web, as they have not successfully been able to get CGI scripts to run from it. Moving to a web server for the school intranet is being investigated to resolve this problem.

Use of open source software for teaching and learning

During Term 1 2004, staff at Grant High School made a whole school deployment of OpenOffice,⁴ distributing copies on CDROM to all staff and students. Apart from the use of OpenOffice some teachers are also using specific open source software: in particular the sound editing software Audacity⁵ and the graphic design software, Gimp.⁶ Some teachers are investigating the potential of Moodle⁷ as a learning management system.

Two Art teachers taught two classes of students both Gimp and Photoshop. One class learnt Gimp first and the other learnt Photoshop first. Asked about their preference in the software, students indicated the software that they had learnt first as their preference. That is, those students who learnt Gimp first indicated a preference for that; the students who learnt Photoshop first, indicated a preference for that. In other words, the teachers found that the students had a preference for the software they had been taught first, as it became the norm for those students. Teachers found that Gimp was a good alternative to Photoshop.

Teachers from different faculties indicated that their students liked the audio editing software Audacity. Teachers and students found it easy and enjoyable to use.

Barometer check: views of parents, students and staff

During the trial Dr Kathryn Moyle met with teachers, students and parents to discuss their views and perceptions of open source software as a result of the whole school deployment of OpenOffice during Term One. Using the guiding questions outlined in the boxes below, the following sections summarise the findings from these conversations.

Parents

Teachers at Grant High School have deployed OpenOffice with the underpinning premise that building ICT flexibility and capability among students and teachers is preferable to developing ICT competence in the use of a single product. Parents however, may be aware that the Microsoft range of products is heavily used in industry. They may also believe there are no alternatives to proprietary software. Staff at Grant High School and in DECS (SA) are interested in parents' views about the advantages and disadvantages of open source vs propriety software. As such

1. How do you, as parents feel about the school de-emphasizing the Microsoft/propriety world and promoting the use of open source software alternatives, or a broader variety of propriety alternatives?

⁴ See <http://www.openoffice.org>

⁵ See <http://audacity.sourceforge.net/>

⁶ See <http://www.gimp.org>

⁷ See <http://www.moodle.com>



All the parents who provided feedback own and manage small businesses in Mount Gambier. Some parents use Apple Macintosh computers at home and at work, and others use PCs and Microsoft products. The parents were all aware that while Microsoft products are heavily used in industry that there are alternatives to using proprietary software.

All parents endorsed the direction being undertaken at Grant High School indicating that in their view, building ICT flexibility and capability among students and teachers is preferable to developing ICT competence in the use of a single product. These parents emphasised the importance of school leavers being able to make a 'smooth transition' between different software packages. They saw it as important that students and school leavers are not afraid to change software formats and that having transferable ICT skills are important to their business. These parents saw a lack of 'lock in' to one particular product over others as central to school leavers adaptability and employability.

The parents who have the Apple computers at home and at work indicated that they were 'biased towards Apple' in part because they had received very few viruses. These parents indicated that they are also actively investigating the use of open source software for building their company website using PHP. They brought to the meeting some information they had had a staff member prepare on the pros and cons of specified proprietary and open source software alternatives for their business. These parents expressed the concern that if they chose to use open source software they may not be able to access someone with the necessary expertise to build and maintain their website and therefore welcomed Grant's approach to open source. These parents noted however, that they had to train their employees in the specific software used in their business, and so the same would apply with the use of open source software. They saw the benefits for their business of using open source software including the reduce costs and the delimitations on the use of software according to the open source software licence requirements.

One parent indicated that her year 8 daughter had developed considerable ICT skills while in primary school, where she learnt how to use a range of Microsoft Office products including WORD and Publisher. She indicated that her daughter had been able to use OpenOffice easily and without difficulty, but that she was tending to revert to what she had learned first at primary school.

All parents saw it as important for their children and school leavers to be able to 'chop and change' between different sorts of software and that it was not an 'either/or' situation but rather an 'and': ie they wanted students at the school to be able to confidently use different sorts of software irrespective of who made it and whether it was open or proprietary.

Teachers

All teachers at Grant High School who teach in years 8-10 are involved in some way with the ICT integration process within the school: that is, the teachers not only support students to use ICT but they actively provide instruction in the use of ICT within their classroom. In English, for example, word processing is taught; in Maths the use of spreadsheets is taught; in LOTE the use of email; and in SOSE, browsing and searching of the Internet. Teachers at Grant High School have deployed OpenOffice to their students. In the conversations with teachers the following focus questions were used:

1. Have the teachers had a go at any of the open source software with which they have been supplied, either on the school computers or at home?
2. How do the teachers feel about the ideas of open public education and the philosophy underpinning open source software?
3. How do staff feel about de-emphasizing the Microsoft/propriety world and promoting the use of open source alternatives, or for that matter, promoting a variety of propriety alternatives?
4. If the teachers feel that broadening the use of software at school makes sense and is consistent with their beliefs about how education should be (ie open and free), then how do they feel about designing activities like the English teacher proving the opportunity for students to use different software? (eg this exercise is to be done using Open Office).
5. What do the teachers see as the issues that might stop them from approaching education in this way?



Dr Kathryn Moyle met with a cross section of teachers whose responsibilities cover a range of subjects and year levels. All the teachers indicated that they philosophically agreed with the use of open source software at school. They articulated the consistency they could see with the principles of providing an education that is open and free with that of the philosophy underpinning open source software. Teachers also indicated that they saw the use of ICT in schools included understanding the social and critical perspectives of using it, as well as its straight technical use.

All the teachers indicated that they were accustomed to using a range of proprietary software for both teaching and learning and personal use. They indicated that they had given the OpenOffice CD 'a go'. Some of the teachers had also asked members of their family to use the OpenOffice CD. The teachers identified a range of perceived low-level difficulties with using the software such as on installation of OpenOffice it became the default software on their computer, and they had not expected this. The consequence of the default setting was (for example) that WORD documents downloaded from the DECS website would open in OpenOffice rather than MS WORD, and this concerned some teachers, albeit the documents opened without any difficulties. Problems with printing were identified (although these were not as a consequence of OpenOffice) and preference for Powerpoint instead of Impress for the importation of images, were identified. Teachers indicated that they saw these issues as 'glitches' rather than substantive, but also indicated that they did not have the time to fiddle around with the software; they wanted it to work seamlessly, first time. The teachers indicated that they would use open source software if it was 'glitch-free'.

The major problem requiring resolution identified by the teachers was the necessity for professional development in how to use open source software in their subject area. They felt to be able to use open source software in the classroom that they needed to be familiar with the software so that they could solve issues as they arose in the classroom. The teachers indicated that this was the case irrespective of the software, however, with open source software there was less likelihood that there were students in their classes who were already familiar with the software that could support them in troubleshooting and problem-solving. The teachers indicated that they were willing to undertake such professional development and made suggestions on how it could be conducted. They suggested that whole school and small groups hands-on sessions would be useful.

Students

All students at Grant High School have been issued with a CD with open source applications software on it. In the research conversations conducted the following questions were used for guidance:

- . What advantages and disadvantages do students see in the school teaching them to use a variety of software including both proprietary and open source software?
- ?. Do students like the idea of having the same software at school and home?
- }. What if the school were to say that Microsoft products are too expensive compared to OpenOffice or Sun Office: would you be concerned if the school said they were not going to use Microsoft products until they were more reasonably priced?

Dr Kathryn Moyle met with a selection of Year 8 and year 9 students. All the students indicated they had received the CD and most of them and given the CD 'a go'. All the students indicated they knew how to use proprietary software and indicated that they had learnt how to use computers in primary school. Some students indicated that they were not interested in computers but they used technologies for finding information and for preparing assignments. Most students indicated that they found the CD easy to follow. The students indicated that they were 'OK' about changing to using OpenOffice. They liked the idea of being able to have the same software at home as at school: 'it was just a matter of getting used to it'. They said they thought an advantage of using open source software would be less viruses.



School leadership

The school leadership supports the use of ICT across the curriculum at the school and have identified it as a school priority. As such, the leadership team has been supporting the migration processes that are underway. In the research conversations the following questions were used for guidance:

1. What do you see are the important factors influencing the ICT directions within the school?
2. How do you support the changes occurring at the school?

Dr Kathryn Moyle met with a cross-section of the school leadership team including the Principal, an Assistant Principal and Coordinators. Motivating factors for using open source software at the school, identified by members of the school leadership team included the cost of proprietary software and in particular Microsoft products. Cost and management of licences was identified as a major motivating factor for moving away from proprietary products to the comparatively lower costs of open source software. Related to the costs of proprietary software, members of the school leadership team compared the costs of proprietary software licences with other priorities within the school, across the state and nationally, and could not justify proprietary software costs when placed against other school priorities such as literacy, numeracy and increasing students engagement at school.

Other factors identified for supporting the use of open source software at the school included:

- the importance placed at the school on developing students' capacity to create and use a range of different sorts of software and to be able to transfer these skills, rather than simply training them to use a given version of a particular piece of software; and
- that the philosophy underpinning open source software matches the philosophy underpinning the teaching and learning fostered by the school.

Given the philosophical commitment of the school leadership team to using open source software to support teaching and learning, a range of whole school change processes were identified that they are using to support the changes. These strategies include:

- promoting and demonstrating that the changes are positive and in students' best interests;
- gaining press coverage in the local newspapers and on television about their approach;
- keeping the school community informed and 'on side' through school newsletters and through the Governing Council;
- monitoring the 'climate' of the school to the changes being undertaken;
- encouraging the development of expertise in open source software by both staff and students by fostering continuous improvement through research and development by the ICT team and across the faculties within the school; and
- ensuring that staff and technical officers are provided with training and professional development in the use of open source software.

The school leadership team takes a consistent approach to change management: the change has to be in the best interests of the students. Specifically in relation to open source software use at Grant High School, the approaches to change at the school mean that there is a whole school climate of support for the use of open source software at both the back and front ends on the 'curriculum' side of the IT infrastructure at the school, where the change is supported at all levels: by the leadership team; the ICT team; faculty coordinators and the staff at the school.



Total Cost of Ownership⁸

Differences between open source and proprietary software that impinge on the costs of software are the cost of the licences and the conditions for use of the licences. Decisions about the deployment and use of ICT including open source software are the responsibility of individual schools and sectors. Understanding the costs of investments in technology can assist school leaders plan for the future. A total cost of ownership (TCO) tool can help schools and school systems conduct technology planning in a systematic way; make informed budgetary decisions; establish a baseline for future research and analysis; and maximize benefits from their investments in technology. To date, there is no research however, pertaining to Australian or New Zealand schools concerning the total cost of deploying ICT generally, nor of using open source software in school environments. The trial at Grant High School began the process of redressing these gaps.⁹

The following first set of TCO figures have been prepared for the Curriculum ICT deployment at Grant High School. Tables Three, Four and Five in Appendix One provide the preliminary figures that informed the development of this TCO.

Table Two: Year One - Total Cost of Ownership of ICT at Grant High School

COMPONENTS	COST	% OF TOTAL
Software acquisition	\$29,000	13%
Software compliance costs	\$22,000	9.8%
Hardware costs	\$80,000	35.6%
Hardware procurement and deployment costs	\$6500	2.9%
Combined direct IT labour support costs	\$50,000	22.2%
Network management: Caching software (only)+	\$0	0%
Services and lease costs	\$0	0%
Dedicated IT running and housing costs	\$7000	3%
Downtime	\$2500	1.1%
Consumables	\$9000	4%
Formal training and professional development	\$19,000	8.4%
TOTAL	\$225,000	100%

+Note: Due to imminent changes to the arrangements, telecommunications costs are not included here

Observations from undertaking the TCO

It became apparent undertaking the TCO at Grant High School, that the financial model used for the allocating the school's funding and that used for undertaking a TCO are different. The school allocates salaries from within its teaching and school support officer hours. Undertaking the processes required to conduct a TCO takes account of the specific costs including labour allocated to undertake individual components of the TCO, across all parts of the school.

It is likely the downtime costs are low as a result of half the servers running open source software. The reliability of these servers remaining up and running has tended to offset the downtime costs associated with the Windows servers and the costs associated with their upgrades, and security patching requirements that are regularly required to keep them working.

⁸ The phrase 'total cost of ownership' was originally developed by Gartner Group Inc. to refer to all the costs associated with the use of computer hardware and software including the administrative costs, licence costs, deployment and configuration, hardware and software updates, training and development, maintenance, technical support and any other costs associated with acquiring, deploying, operating, maintaining and upgrading computer systems in organisations.

⁹ More information about open source software and TCO can be found in the research paper prepared about these topics, as part of this research project.



Taking a TCO approach has highlighted how complex and expensive it is to manage at the local level the wide variety of proprietary licences (with their different conditions, timeframes and renewal requirements). The TCO also highlighted some competing policy positions about which the school has had to make some pragmatic decisions. To illustrate: there is the policy aim to increase computer to student ratios at the local level. It is preferable to do so within a standardised IT environment where the age range of the computers is kept low. The school has a limited budget however, and so recycled computers offer this school a cost effective solution in comparison to the costs of purchasing new computers to achieve the same computer to student ratios; and recycling of government and business computers is supported by government and IT industry programs. Furthermore, where there are competing demands for finances, the use of recycled computers can be seen as a defensible way of expending public funds in an environmentally-friendly manner.

Alongside of these IT infrastructure issues sit educational issues. In a TCO Framework these can be considered as 'intangibles'. Grant High School is aiming to provide a broad general education, including in the use of ICT in teaching and learning. Different faculties use subject specific software as well as publishing and presentation software. Those staff at the school choosing to include open source software in their suite of software for use in teaching and learning, articulate philosophical and socially critical reasons for broadening the school's ICT environment. They see it as important that students leave school not only confident and creative in using ICT but that they have the flexibility and adaptability to be able to transfer their skills across a range of software packages. In other words, these teachers see it as more important to teach the generic skills that underpin the use of technologies in classrooms as well as the instrumental functionality of specific software programs. Teachers using open source software also talk about the importance of students learning about the impact of technologies on society: open source software provides an authentic issue about which to discuss broader issues concerning the acquisition of proprietary and open source software. Broadening the software environment however, also presents challenges for methods of standardising the software environment. Nonetheless, it is these 'intangible' educational issues that are of importance to the community at Grant High School, not only cost factors.

It is the view of both the leadership and ICT teams at Grant, that irrespective of the software deployed, they require technical and ICT salaries to keep the infrastructure of the school running. They see it is a responsible approach to financial management to use open source as they believe they are getting better value from public money. The school acknowledges and manages the risks associated with such an approach by developing technical expertise in the local community.

Conclusions and recommendations

Through this research project trialing both open source operating systems and applications software, it is apparent to the Grant High School community that open source software does have a place in the school's ICT portfolio, and that they are looking to increase its use.

Recommendations:

The following recommendations have emerged from the trial that require consideration at school, jurisdictional and national levels.

Grant High School

It is recommended that

- Staff at Grant High School work with their local feeder primary schools to support and encourage staff to teach students open source software applications as their first experiences of computing rather than after they have first learnt proprietary software.
- Grant High School work in collaboration with the local TAFE to establish a hub of industry development around the use of open source software.
- Grant High School develop a list of local employers using or are interested in developing their capacity using open source software.



DECS (SA)

It is recommended that

- DECS (SA) provide the findings from the trial at Grant High School to the South Australian government inter-agency Open Source Software Reference Group.
- In the next round of negotiations with Microsoft, DECS (SA) seek to unbundle the package of operating systems and applications software without additional cost.
- DECS (SA) draw on the expertise at Grant High School to support other interested schools within the jurisdiction to migrate to open source software.
- DECS (SA) continue to monitor the costs and document the developments at Grant High School.

National level

It is recommended that

- Given the rapid adoption of open source software by governments and education systems around the world, the MCEETYA ICT in Schools Taskforce consider establishing a sub-committee of the Taskforce to provide high level advice to the Taskforce and individual jurisdictions concerning developments in open source software in Australia and overseas.
- Jurisdictions and national agencies continue to gather intelligence as a result of research, trialing and deploying open source software in order to create a negotiating position with proprietary vendors of software and standards.
- National negotiations with Microsoft Corporation use the leverage created through such an approach to gain an unbundling of specific software components covered in the contract and in particular to unbundle operating systems from applications software without increased price to the customer.

Future plans

The IT team at Grant High School is aiming to continue to provide students with increased access to computers by reducing the computer to student ratios. Grant High School's future plans for ICT deployment are premised on the assumption that learning management systems will become the next generation of curriculum delivery tools that they will use at the school. As such the students will require increased access to computers.

Given the school sees it as critical to increase student access to computers, it is their aim to roll-out and maintain the extra computers in such a manner that they do not create additional burden on the in-school IT team. Through the research and trials the school have conducted over the past few years, the IT team has learnt that they can effectively use and manage recycled computers for teaching and learning purposes and to make efficiencies in the labour required to managed these computers.

The school is currently testing the deployment of Linux terminal services. Through these processes of research and development, terminal services have emerged as a robust solution to increasing the number of computers available for use by students without making comparative increases in the staff required to manage the computers. Once the terminal services are established, the school anticipates rolling out a learning management system for use by all Year 8-10 students.

The school sees universities and TAFEs using learning management systems, and so they believe that if their students have had prior experience in using learning management software they may be more successful in their future endeavours. Moodle¹⁰ is being trialed for these purposes. The school will review the use of learning management systems in the junior years and if it is successful they may broaden its' use to the senior school or use learning management systems to provide more options to students post school.

¹⁰ Trials of Moodle are being conducted in selected schools across South Australia in 2004.



Appendix One

- Table Three: Identifying costs: servers using open source operating system software at Grant High School (2004)
- Table Four: Identifying costs: servers using proprietary operating system software at Grant High School (2004)
- Table Five: Desktop Applications - proprietary and open source software at Grant High School (2004)



Table Three: Identifying costs: servers using open source operating system software at Grant High School (2004)

Open Source Software Servers	Operating System	Operating system software licence costs ¹¹	Most important applications	Cost of acquiring important applications software ¹²	Assumptions: Role of server	Server hardware	Cost of server hardware ¹³
OSS 1	SME-Server 6.0b2	\$0	Linux, Apache, MySQL, PHP	\$0	Serves as SQL server for Schoolmation, Moodle and MRBS Booking	IBM PC300PL	\$300.00
OSS 2	SME Server 5.6	\$0	Squid, Samba	\$0	Squid Proxy Server	IBM PC300PL	\$300.00
OSS 3	SME Server 6.0b2	\$0	Apache	\$0	Open Source Software Mirror	IBM PC300PL	\$300.00
OSS 4	SNS-server v1.3	\$0	Red Hat 8	\$0	Linux Domain Controller, testbed only	IBM PC300PL	\$300.00
OSS 5	Fedora Core 1	\$0	K12LTSP v4.0	\$0	Linux Terminal Server	Dual Athlon 1700	\$300.00
OSS 6	Fedora Core 1	\$0	K12LTSP v4.0	\$0	Linux Terminal Server	Dual Athlon 1700	\$2,500.00
OSS 7	Redhat 8.0	\$0	LTSP	\$0	Sandbox Linux Terminal Server Project server, not in 'public' use	Dual Athlon 1700	\$2,500.00
SUMMARY COST OF HARDWARE AND SOFTWARE		\$0		\$0			\$6,500.00

¹¹ Does not include labour [next step is calculate labour costs]

¹² Does not include labour next step is calculate labour costs]

¹³ Purchased secondhand



Table Four: Identifying costs: servers using proprietary operating system software at Grant High School (2004)

Proprietary servers	Server Operating System	Operating system software licence costs ¹⁴	Most important applications	Cost of acquiring important applications software ¹⁵	Assumptions: Role of server	Server hardware ¹⁶	Cost of server hardware ¹⁷
MS 1	Windows 2000	\$200	Windows applets: ADS, DHCP, DNS,	\$0	Domain Controller for our primary domain	Athlon XP1800+	\$900
MS 2	Windows 2003	\$200	ADS, DHCP, DNS	\$0	Primary Domain Controller	Dual Athlon 1700	\$2500
MS 3	Windows 2000	\$200	Printer Accounting Server	\$495 ¹⁸	Printserver with accounting for 17 printers	K6-500	\$300
MS 4	Windows 2000	\$200	Windows applet: ISS4,	\$0	Intranet and user files backup, virus scanner update point	Intel PIII/800	\$300
			ArcServe 6 AE	\$1000			
MS 5	Windows XP Pro ¹⁹	\$0	Ghost 7.5 EE	\$3000 ²⁰	Ghost Server	IBM PC300PL	\$300
MS 6	Windows 2000	\$200	Terminal Services, RAS	\$0	Remote access server, Windows Terminal Server	Dual Intel PIII/933	\$2,500
MS 7	Windows 2000	\$200	Amlib,	\$3000 ²¹	Library System server with own backup	Athlon XP1600+	\$2,800
			MS SQL	\$400			
			ArcServe 6 AE	\$0 ²²			
TOTAL		\$1200		\$9895			\$9,900

¹⁴ Does not include labour. Costs as per the School Select Agreement.

¹⁵ Does not include labour. \$0 costs in this column are as a result of these functions being included in the MS licence agreement.

¹⁶ Secondhand hardware

¹⁷ Purchased secondhand

¹⁸ \$150 per annum for server upgrades

¹⁹ Windows XP Pro is covered under the departmental Enterprise Agreement

²⁰ Cost per desktop licence

²¹ This price is for year one. There is an ongoing cost of \$1500 per year for maintenance

²² Included in abovementioned cost for ArcServe 6 AE



Table Five: Desktop Applications - proprietary and open source software at Grant High School (2004)

Main desktop applications used by students and staff.

Most important proprietary desktop applications	Applications software licence costs ²³		Role of important applications software ²⁴	Most important open source software desktop applications	Applications software licence costs ²⁵	
	School	Central Office			School	Central Office
MS Word (MS Office)	\$4000 ²⁶	Not for disclosure	Word processing	Text document (OpenOffice)	\$0	\$0
MS Excel (MS Office)			Spreadsheet	Spreadsheet (OpenOffice)	\$0	\$0
MS powerpoint (MS Office)			Presentation	Presentation (OpenOffice)	\$0	\$0
MS Access			Database	MySQL	\$0	\$0
Frontpage			Web-page design tool	NVU	\$0	\$0
Publisher			Desktop publishing tool	Gimp	\$0	\$0
Visual studio			Programming	Python	\$0	\$0
Encarta			Reference materials	Online materials eg K12 Linux	\$0	\$0
Step-by-Step			Tutorials	Online tutorials	\$0	\$0
WinZip			Under evaluation	\$0	GZip	\$0
TOTAL	\$4025	Not for disclosure	TOTAL	\$0	\$0	

Other proprietary software

Licences and maintenance agreements vary for each of these licences. Each piece of software was costed per the number of licences and total entered into *the Total Cost of Ownership Data Collection proforma*. Grant High School only pays a small percentage of the total cost for their licences covered under the Microsoft Schools and Campus Agreement. The remaining licences are paid for and managed at the school level. Other software the school purchases includes:

- Photoshop
- Accelerator
- FX (Maths)
- Finale
- Sibelius
- PC Stage
- Pinnacle Studio
- Tricad
- Special education CDs
- Japanese word processor
- Careers software
- Mapinfo
- Science software

²³ Does not include labour. Cost of Microsoft licences is shared between the school and central office. The cost of the licence includes the applications software and the desktop server software

²⁴ Does not include labour

²⁵ Does not include labour

²⁶ This contribution represents a small part of the total cost

