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Evaluation of pilot electronic submissions for verification

Erica Bell (Policy & Evaluation)

Floor 7, 295 Ann St Brisbane Queensland
PO Box 307 Spring Hill Qld 4004
Telephone: (07) 3864 0299
Fax: (07) 3221 2553
Email: office@qbssss.edu.au
Website: www.qbssss.edu.au
job 1366

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EXECUTIVE SUMMARY

This study is an evaluation of how well pilot procedures for electronic submission[1] of school submissions for verification functioned for schools, panels, and the Board. Six schools were involved from two subject groups (Graphics and Art).

The study includes a literature survey, as well as telephone surveys of other Australian authorities to explore relevant national and international precedents and wisdom on this subject. A telephone survey was also conducted of a random sample of 60 Queensland school subject-groups to offer indicative information about the extent of use of computers in schoolwork.

The study findings support further cautious development by the Board of its verification procedures. The broad findings of the study are as follows:

- The survey of interstate practices suggests that some other Australian authorities do allow schools to submit work electronically for the purposes of moderation in particular subjects.
- There is an argument to be made that work done originally in electronic formats, notably work done using industry specific computer applications, is best showcased electronically.
- It is likely that in some subjects, schools and panels are highly motivated to make electronic submission for verification work.

The following directions seem recommended by the evaluation findings:

- The conduct of a restricted trial of electronic submissions for verification for a selected group of subjects and schools in 2001 which should include Graphics, Information Processing & Technology, and Art at least; this trial should be evaluated and the results presented to the Board's Moderation Committee
- The establishment of a standing group on technology use in the Board's moderation procedures to assist the Board; this group should include teachers from at least the subjects Graphics, Information Processing & Technology, and Art
- The development by the Board of a template offering a standardised format for electronic submissions for verification (either through the proposed standing committee for technology in moderation procedures, or using some other mechanism).

[1] While most of the school subject-groups in this study did not submit the whole of their submission electronically, and some submitted a very small proportion, for the sake of convenience in this report the term 'electronic submission' is used to mean any submission in this pilot that was in whole or part electronic.

AIM

This study offers possible directions for further work; it does not provide definitive conclusions, although it does correct certain simplistic assumptions

The aim of this report is to offer a basis for forward momentum for a Board working group (in the first instance) looking at how computer technology might be used in the Board's verification procedures.

Specifically, the report aims to evaluate how well pilot procedures for electronic submissions for verification worked in 2000 in ways that explore implications of the pilot for panels, schools, and the Board. The report of the evaluation aims to offer key directions for further work by the Assessment, Moderation and Technology Working Group. The nature of the pilot procedures used allow this study to provide some basis for reflecting on what these directions should be. It does not offer a basis for conclusive or definitive findings, although it does provide a basis for correcting some simplistic assumptions about what is or should be the case.

Method

The evaluation was designed to answer some specific questions about the experience of panels and schools involved in the pilot, but the study also offers other information

The research questions are those that provide a point of departure for the construction of research instruments given in appendices 1, 2, and 3. In this study they are divided into questions for panels and questions for schools (implications for the Board can, of course, be 'read off' data obtained using these questions). They are the questions that the working group wanted the report to answer, as far as possible.

Questions for panels

Mechanics of the verification meeting

- Did the electronic submission take longer to review/pre-review?
- Were you able to review the submission entirely on screen, or did you have to print out parts? Which parts and why?
- Having been involved in verification of an electronic submission, what demonstrated issues (in this meeting) and potential issues (i.e. advantages and disadvantages) with the actual running of the meeting do you see as DRPC?

Determining standards

- Were there specific difficulties (e.g. to do with determining standards) in reviewing/pre-reviewing that related to the electronic mode used?
- Did the electronic mode provide more and better information on which the panel could base its advice to the school?
- How well did the pre-reviewing checklist work for electronic submissions?
- Having been involved in verification of an electronic submission, do you see any demonstrated (in this submission) or potential issues of authenticity of student work?
- Considering the experience of verifying an electronic submission, what

demonstrated and potential issues of validity of assessment do you see (i.e. does the electronic mode affect the extent to which assessment situations actually assess what on face value they purport to assess)?

Overall

- What changes to the electronic submission (format etc.) would have worked better for the verification process? Why?
- How would you describe the overall experience of verification of the electronic submission (i.e. advantages, disadvantages, how worthwhile you felt it was, how much you enjoyed it etc.)?

Questions for schools

Preparation

- What steps did you take to make the electronic submission happen at your school i.e. what procedures and processes did you use?
- Did preparation of the electronic submission take longer than you think would have been the case with a paper version of the same submission?
- What costs were involved in preparing your submission electronically (compared with the usual cost of a paper submission in the same subject)?

Effects on teaching, learning, and assessment

- Does the electronic mode present any barriers to teaching, learning, and assessment (students showing what they know and can do)? If so, what barriers? (include anything that actually occurred as well as potential issues)
- Does the electronic mode offer specific advantages for teaching, learning, and assessment? If so, what advantages? (include any actually occurring advantages for your school as well as potential advantages).

Of course, the evaluation exercise was not limited to answering just these questions. A small literature review was completed, as well as a quick telephone survey which gauged the extent of electronic submission of student work in the testing and moderation procedures of senior certification authorities across Australia. To get indicative information about the nature and extent of use of computers in student work in Queensland, we also conducted a telephone survey using a random sample of 60 school subject-groups.

The pilot procedure for electronic submission of student work was a very restricted one involving six schools and two subjects

The pilot initially involved seven schools and three subjects (Beaudesert SHS and Brisbane Boys' College (for Art), Palm Beach Currumbin SHS, Helensvale SHS, Windaroo SHS and Robina SHS (for Graphics), and The Glennie School (for Information Processing & Technology)). Four verification sites were initially involved. However, as the Glennie School was unable to participate, this reduced the number of schools, subjects and verification sites that were actually involved in the procedure to six, two and three respectively.

The school subject-groups and panels involved in this pilot may tell us what the technology boundary pushers think, but not what the issues are for the broader school or panel communities

The school subject-groups (they self-selected) in this study by and large represent a small and highly enthusiastic group. That is, the four Graphics submissions involved in this study probably come from teachers who are making more use of

electronic mediums in their teaching and assessment, and their students may well be more electronically sophisticated learners. This may be largely because Graphics in particular is a subject with real scope for electronic approaches to teaching, learning and assessment. For example, in this subject students can demonstrate sophisticated achievements in design using electronic line drawings and renderings of those drawings in software packages that are also used in industry settings.

Correspondingly, panellists in Graphics may be more likely to see the benefits of electronic submission for their subject.

Accordingly this report can be regarded as a 'seed bed' for ideas about future directions, giving a sense of what the technology boundary pushers think, but not an indication of how wider school and panel communities might fare with electronic submissions. Even for these particular pilot subjects, what seems needed is a wider trial that would provide a better basis for understanding difficulties, and developing the best possible procedures for electronic submissions for verification.

The school subject-groups and panels involved in this pilot are given in table 1.

Table 1 : School subject-groups and panels involved in the pilot

Subject	*District Review Panel Chair*	*Panellist completing pre-review of submission*
Information Processing & Technology		**Glennie School** (school withdrew but provided comments to the evaluator)
Graphics	Bob Jordan Palm Beach Currumbin State High School	**Robina SHS** Wayne Van Den Bos, Coomera Anglican College **Windaroo Valley** Robert Ford, St Michaels College **Palm Beach Currumbin SHS** Warrick Glaves, All Saints Anglican School **Helensvale SHS** Wayne Halford, Southport SHS
Art	Julie Peachey Corinda State High School	**Brisbane Boys' College** Ruth Horton, Marist College Ashgrove
	Jenny Fletcher Marsden State High School	**Beaudesert SHS** Sandra Johnson, Windaroo Valley SHS

Most school subject-groups involved in this study did not submit the whole submission electronically

In a context where electronic submissions are a novel insertion into a well established procedure — verification — the act of describing what was submitted electronically can be a useful part of the evaluation exercise. It also helps us get a better understanding of the evaluation findings.

The pieces of student work submitted electronically by the six schools involved in the trial can be described as ranging from scanned and digitally photographed

work (for Art and Graphics students) to work done originally in electronic format (for Graphics students): at least one school (Robina SHS for Graphics) submitted student work that is a mixture of scanned work and work done originally in electronic formats. Only one school (Helensvale SHS) submitted all student work for all students, and at this school extensive use is made of electronic approaches to teaching, learning and assessment. This school has a long history extending over the last decade with use of CADDSMAN[2] software packages.

The two formats used were PowerPoint on CD-ROM (which was a Board specification for participation in the pilot) for five schools and a website presentation for one school (Brisbane Boys' College).

Table 2 summarises the nature of electronic (in whole or part) submissions involved in this study.

Table 2 : Description of electronic submissions (table spreads over 2 pages)

Subject	*School*	*Electronic format/links*	*Description of submission content and structure*
Graphics	Robina SHS	PowerPoint (CD-ROM)	One house design assignment for one VHA student originally done electronically (submission also includes scanned notes and drawings) *No assessment information, linear structure for moving through the assignment*
	Windaroo Valley SHS	PowerPoint (CD-ROM)	CAD classwork, CAD test, and 1-2 design assignments for five VHA and HA students *No assessment information, linear structure for moving through student work*
	Palm Beach Currumbin SHS	PowerPoint (CD-ROM)	One major assignment for six VHA and HA students who elected to participate out of a group of eight (evaluator given a sample of this electronic submission in the form of the assignment done by a VHA student ; digital camera reproduction of computer screen CAD work as well as real objects) *No assessment information, linear structure for moving through student work.*
	Helensvale SHS	PowerPoint (CD-ROM)	All of material normally placed in the folios for all students in the Senior Graphics cohort (six students). Examinations, classwork, and assignments done originally in electronic format. Includes rendered 3D video animations (with sound) for assignment work. *No assessment information, on main contents page links to each student, on contents page for each student, links to each assessment piece.*

[2] CADDSMAN is the name of a company that sells software packages to schools, including architectural drafting packages used by the Graphics school subject-groups in this pilot study. The evaluator contacted the

Art	Brisbane Boys' College	Website	Scanned photographs of artwork for all nine students in sample from LA to VHA. Hard copy of all electronically submitted work also provided. Tasksheets also provided. *Linear structure for moving through student work ; tasksheets provided but no links between student work and tasksheets or between tasksheets*
	Beaudesert SHS	PowerPoint (CD-ROM)	'Developmental' and 'Application' work for all students (as available). For one of these nine students one 'Appraising unit'. Digital camera used to reproduce student work. *On main contents page links to work program, R6, and links to each student. On contents page only for each student links to Profile, R6, and links between student responses and task sheet*.

The choice of pilot subjects also means that some key areas of electronic design and display remain unexplored

Interestingly, the inclusion in this study of only Art and Graphics school subject-groups gives our indicative findings an emphasis on matters of display of student designs, drawings and paintings. Less information about display of language texts produced by students was produced (although Beaudesert SHS's electronic Art submission did involve written text accompanying images and the pre-reviewer was positive about the reproduction of this). Yet it is likely that reproduction of language texts presents a whole extra set of design and display challenges.

Clearly, moving through Graphics or Art designs on screen may be much easier than dealing with bulky submissions, but reading extended written texts produced by students on existing computer screens may well impose hardships that hard copy does not (eyestrain, fatigue, and so on).

In this study the main approach used was short semi-structured telephone interviews

For resource reasons, short telephone interviews were used to obtain data from the different groups of participants involved in the study. However, the evaluator was able to visit four of the six schools to look at the student work on screen in the presence of the teacher who had prepared the submission. The form used to obtain data from schools is given in appendix 1 and the forms used to obtain data from panellists are given in appendices 2 and 3. The evaluator also collected a copy of the electronic submission from the schools involved in the pilot.

The telephone form used to survey the extent of computer use in student work in Queensland school subject-groups can be found in appendix 4, together with details of school subject-groups contacted. The telephone form used to survey developing practices in other Australian authorities is given in appendix 5.

While the methods used were limited by pragmatic considerations, they did produce useful information about the 'ins and outs' of electronic submission for verification

It is worth emphasising that the short timeline for this evaluation, and the limited

resources available did prescribe our methods to a considerable extent. However, it seems unlikely that a longer timeline and more resources would have produced a different result. This is because the methods (largely quick semi-structured phone interviews) seemed to work reasonably well for the particular purpose they were collected.

What an evaluation of this kind can offer is a careful assessment of how the restricted pilot procedures went that includes details of the 'ins and outs' of electronic submission, leading to suggestions for further work. The study can also be used to question certain definitive assumptions about what is the case (i.e. 'other Boards are doing it', 'all schools have gone electronic so the Board should', 'there are no problems with giving schools the option of electronic submission of student work', and so on).

Background: National and international precedents

Computer technology has been seen to enhance the quality of teaching, learning and assessment

The question about the value of electronic submission of student work is, in part, a question about the value of computer technology to teaching, learning, and assessment, for verification requirements, will inevitably find an effect in what teachers and students do.

Proponents of the central place of computer technology in teaching, learning and assessment argue that it works to enhance the quality of these. Interestingly though, most of the claims for the benefits of computer technology occur in contexts where the desire is to move away from standardised norm-referenced testing to a system with multiple modes of criterion-referenced assessment, a movement that occurred in Queensland some decades ago. In short, most studies and papers (produced both interstate and overseas) seem to refer to computers as bringing reforms of educational practice that have largely occurred in Queensland.

The shift associated with use of computer technology in classrooms is towards 'performance assessment' (demonstrated achievement as opposed to measurement of underlying traits) and 'authentic assessment' in alternative modes, particularly assessment of complex higher-order skills, displayed in student 'portfolios'. The fact that these changes in Queensland senior schooling have occurred not through the vehicle of computer technology seems to question the views of education techno-enthusiasts that computer technology is essential to a paradigm shift away from traditional testing regimes.

Most studies do not focus exclusively on senior secondary school contexts. However, a scan of the literature from the 1990s suggest that the following claims are made for computer technology in educational settings:

- use of computer technology in assessment fosters reform of teaching and learning, not least through the use of alternative assessment forms allowing assessment (as well as storage and dissemination) of products and processes not limited to pen-and-paper technology; in a recent review of the links between technology and alternative assessment in America, for example, it is claimed that 'in science, the paper-and-pencil testing system has driven education to emphasise just two abilities: recall of facts and concepts, and ability to solve short, well-defined problems' (ERIC Digests 1993, p. 2)
- computers reduce the dependency of the student on the teacher,

'democratising' education (Goodyer 2000), liberating the teacher's time and giving the student greater autonomy
- this liberates the student and the teacher to engage in quality communication leading to 'mindful, deliberate deployment of higher-order thinking processes such as synthesising, interpreting and hypothesising' (Goodyer 2000)
- computer technology offers a basis for authentic assessment by increasing the range of information that can be included in student work, as well as increasing its professional appearance
- computer technology offers a degree of interaction and self-paced learning that leads to higher than normal engagement in classrooms where teachers cannot provide sufficient interventions to sustain the task (Davis 1997, p. 15)
- computers provide greater educational gains for less-able students, and also may be helpful for students with motivational and behavioural/attendance difficulties (Salier 1997; Byrom (website))
- the use of computers in the classroom leads to an increase in performance in different learning areas (Salier 1997 cites extensive reviews involving hundreds of studies, including one of 500 studies and another of 130 studies that he says demonstrate that using technology to support teaching improved student outcomes in the use of language, mathematics, social science, and science)
- assessment can be more interactive (Goodyer 2000)
- computers can provide an interpretative framework for viewing student performance and for teacher feedback on this performance
- computers can offer improved analysis and reporting tools (at the individual level and also at the level of system-wide benchmarking of standards)
- computer technology can help facilitate moderation processes by facilitating shared understandings of standards through easier dissemination of student exemplars (Sheingold and Frederiksen 1994, p. 112).

However, there are known difficulties, limitations and barriers presented by the use of computer technology in learning, teaching, and assessment

What does a scan of the literature suggest about the difficulties, limitations, and barriers presented by the use of technology in learning, teaching and assessment? Again, this is part of the question about the value and feasibility of having electronic submissions for verification. For example:

- computer software imposes a structure on information that limits not only the interrogation a student can make, but also potentially how the student can think about a subject (Underwood and Underwood 1990)
- without appropriate teacher framing and structuring, computer technology can present mundane tasks that actually negate quality learning (Davis 1997, p.15)
- there are serious questions about the quality of computer-based materials, existing and potential; for example, material available on the internet has 'not necessarily gone through the authentication and quality review processes involved in conventional publication' (Goodyer 2000, p. 4)
- computer-based learning has been shown to raise gender-equity problems (ERIC Digests 1993)
- it is likely that as the interface between computers and their users is very

significant, different user interface devices may affect student performance and possibly the validity of assessment items

- those raising these kinds of questions have also long argued that there is inadequate evidence for evaluating the effectiveness of computer technology in education; if this is true, it would apply more to senior secondary schooling than other stages of education; certainly, there is no common yardstick for such evaluations[3]
- commentators have long pointed to the difficulties some teachers have experienced acquiring the necessary computer skills, including lack of release time for learning new technology (Goodyer 2000; Smerdon 2000)
- there are probably significant differences in the access to computer technology that students experience in different schools; not only that, but if Queensland is anything like America (see Smerdon 2000)[4], having computers in schools is a very different thing from actually using them in classroom practices, and it is likely that many teachers are *not* using computer technology in teaching, learning and assessment[5]; the same studies also suggest that in those senior classrooms where it is a significant tool, there are very significant differences in the extent and nature of the use of computer technology
- integration of technology into classroom practice is a resource-intensive enterprise that can take some years; Byrom (website) notes that 'it takes an average of four or five years for teachers to reach a point where they can seamlessly mix technology-based instructional strategies with traditional instruction' (p. 6); most syllabuses and assessment instruments are not designed with computer-generated student responses in mind
- there are clear needs for school- and system-level policies to manage information stored and disseminated electronically; for presenting student work in electronic formats raises matters of privacy and access not raised in quite the same way by student work in paper formats (Goodyer 2000).

Overseas experience suggests that creating and presenting student work electronically may help increase the use of student folios in selection for further education and employment

As has been pointed out, the use of 'authentic' assessment in which students demonstrate achievement in 'real-life' situations and student work is represented in a 'portfolio', has been associated with, and arguably facilitated by, the use of computer-based teaching and learning. In the United States in particular the creation and storage of student portfolios using computer technology received considerable attention in the 1990s. Schools in the United States have used specific programs (Aurbach's Grady Profile) that provide a template for teachers and students to enter work samples. Other software programs used (such as Roger

[3] McNabb (1999) argues in her recent review of evaluations of the effectiveness of technology in American classrooms 'in order for evaluation efforts to provide stakeholders with answers to their questions about the effectiveness of technology in education, everyone must agree on a common language and standards of practice for measuring how schools achieve that end' (p.2).

[4] With reference to a 1999 survey in America, Smerdon (2000) writes that 'about half of the teachers with computers available in their schools used them for instruction' (p. iv).

[5] Byrom (website) says that in 1997 'less than 3 % of America's schools are at the leading edge of effectively integrating technology into classroom practices' (p.2).

Wagner Publishing's HyperStudio and Claris's FileMaker Pro) have allowed teachers to create their own templates for portfolio assessment (Barrett 1994). For example, students at the East Syracuse-Minoa High School in New York have created portfolios that are used for selection to further education and employment; the portfolio is created in Hyperstudio and contains a broad range of information, including samples up-dated by students; it can be distributed by computer disk, CD-ROM, video tape, or print versions. Such precedents suggest that electronic submission of student work might have the advantage of making it easier for students to present their folios for the purposes of selection to further education and employment.

In other Australian systems, using computers for testing of senior students is presently restricted to special consideration; however, there are precedents for submission of student work electronically for moderation purposes

An evaluation report of a modest pilot like this would not really be complete without some information about what precedents, in terms of electronic submission of student work, there are in other Australian states. This information can be helpful for those wanting to reflect on how QBSSSS practices compare to those of similar bodies interstate. Yet this information must always be read with the different contexts of the different authorities in mind. Our history, geography, community values and education systems are different, and consequently electronic submission of student work (in different testing or moderation procedures) is going to have very different imperatives, meanings, advantages, and disadvantages.

Appendix 5 shows the phone form used to talk informally with staff of all Australian authorities whose CEOs are members of Australasian Curriculum Assessment and Certification Authorities (ACACA). The idea was to get a sense of what, if any, developments had occurred in electronic assessment as it directly impinged on the procedures of each authority. The questions asked were not about use of computers in school-based assessment; they were more about whether students could submit work electronically as part of the authority's testing and/or moderation procedures. The method used did not allow us to do much more than get a broad sense of what is occurring across Australia, an approach that seems suited to the nature of this report as a 'seed bed' for ideas.

The broad finding of this exercise is that, in other Australian states, using computers for testing of senior students using computers is presently restricted to special consideration; however, there are precedents for submission of student work electronically for moderation purposes.

In Victoria where most of the work in online testing in Australia appears to be happening, there have been developments but only for the compulsory years. There are no immediate plans in Victoria (or any other Australian state) for online testing at the senior level. However, in relation to central moderation procedures it has been the case that, in Information Technology and other subjects, student work could be submitted and reviewed electronically. However, under a new system, from next year this student work will be teacher-assessed, and for only a minority of subjects (with 'extended tasks') might 'moderation' visits to schools be made following anomaly detection. Therefore it could be said that Victoria does not have the same imperatives for electronic submission for moderation that exist in Queensland. Yet, Victoria might have greater imperatives for online examinations perhaps because of the practicalities of organising examinations following recent

amalgamations of schools in that state.

In New South Wales, which has a very strong examinations culture, written examinations and school-based assessment can be viewed as quite separate. All examinations are paper-based and, as for other states, only in the most incidental way (through special consideration) is student work submitted in electronic formats. The New South Wales Board of Studies has no involvement with school-based assessment. While the authority has considered adaptive electronic examinations, there has been little serious broad community pressure to have examinations in electronic formats.

The Senior Secondary Assessment Board of South Australia (SSABSA) presently does not use electronic formats in testing students. However, it has developed an option for online testing for Mathematics subjects for 2002. Information has already been issued to schools about this option: there are concerns with the standardisation of examination conditions, particularly where students are using software such as graphics packages rather than relatively basic word processing. SSABSA is looking at, but has no immediate plans for, online examinations in other subjects. This authority also allows work to be submitted electronically for its central moderation purposes in such subjects as Information Technology (an option the 19 schools in the Northern Territory offering this subject have taken up, as the NT system is under the South Australian system). However, most student work is not submitted electronically for moderation.

The NT Board of Studies said that it has more students taking the Information Technology subject 'Computer Applications' than South Australia and that work in this subject is submitted on CD-ROM. Interestingly, electronic submission of student work in this subject to SSABSA from the Northern Territory has been occurring for some years. The moderation meeting takes place in Adelaide and this is where the work is forwarded. However, only the rather large, final project work (one or two pieces of work) is forwarded, not the whole two years of senior work.

The ACT Board of Senior Secondary Studies has no plans for online testing or for electronic submission of student work for moderation (the ACT is our closest relative as an education system). They said that, as a small territory, the strong advantages for electronic submission of student work for moderation simply do not exist for them in the way they do for a larger authority. However, like other authorities, they are exploring how to use technology in their other procedures (such as student access to electronic records).

The Tasmanian Secondary Assessment Board also has no immediate plans for electronic testing. Its examinations are paper-based and electronic submission of student work in these examinations occurs only under special consideration arrangements. For the purposes of moderation of externally assessed parts of schoolwork, there is no electronic submission of student work; in a small state without the 'tyranny of distance', examiners visit schools to view student work in subjects like Graphics where computer-based approaches are a substantive part of what is being assessed.

Western Australia currently has no plans for on-line testing, although like other authorities, their Curriculum Council has developed procedures for making such things as support materials available to schools. For the purposes of moderation, teachers bring student work to consensus meetings with Council moderators. The Council does specify that some of this work be in electronic formats in subjects like information technology. This is not to say that work is being submitted electronically to the Office of the Council; the Council is currently exploring the

feasibility of getting schools to do this. Significantly, the recent review of post-compulsory education contains, as a key direction, on-line testing and electronic submission of student work for the purposes of moderation.

What does all this add up to for Queensland and for this research exercise? It seems that no ACACA authority has experience with electronic testing or moderation procedures on a large scale, but there is some development work going on, particularly in South Australia and Victoria. There are also precedents in these two states and in Western Australia for allowing schools to submit work electronically in particular subjects for the purposes of moderation, notably subjects where skills with computing are a substantive part of what is being assessed.

Developing new applications of technology to Board procedures and practices may be helped by having a specific strategic goal for achieving this

Scrutiny of the practices of ACACA members suggests that development of some board of studies procedures through the best use of information technology can occur under a specific strategic goal for technology (this is the case for the Victorian Board of Studies)[6]. However, as Professor Gordon Stanley, President of the NSW Board of Studies, notes in the foreword to a paper on the subject by Andrew Goodyer (2000), there is still 'a considerable gap between the rhetoric of the techno-enthusiast and the reality of contemporary experience in the classroom' (p.2).

Nonetheless, American studies of technology integration in school practices suggest that the leadership of individuals and even government organisations can play a crucial role in developing the use of technology: 'A consistent theme across all states is that where there is no collaboration among leaders, there may be pockets of successful programs or initiatives, but these are usually dependent on individuals, and when the individuals leave, the programs disappear' (Byrom (website)). This suggests the importance of the Queensland board as a leader with a vision of the place of technology in senior schooling, specifically in curriculum and certification practices.

The literature on technology use in education also suggests some expensive false starts

Those who have a vision of electronic submission of student work in Queensland one day dispensing with the need for panels to meet on the day of verification might want to reflect on the interesting question of whether, like learning, moderation is in part a social and collaborative activity. Goodyer (2000) points out that 'the first virtual university in the United States has subsequently established a

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[6] Under this strategic goal the Victorian Board of Studies has developed a computer-based testing system called the 'Victorian Student Achievement Monitor (VSAM)' for Years 7 and 9 in English and Mathematics. It functions as a supplement to existing assessment and reporting programs (linking individual data to state standards) and can be described as a computer adaptive Internet delivered testing system. In VSAM, questions are constructed from a Curriculum and Standards Framework (CSF). These questions are presented to students through adaptive and interactive computer based testing that allows rapid return of reports.

physical campus as a result of student requests, to meet needs for social contact and collaborative activity' (p.7).

Background: Practices in Queensland schools

The view that student work needs to be showcased digitally to be properly showcased might apply to a restricted group of subjects and school subject-groups; but that may not be true in the long term

Another background question that readers of this evaluation might want to reflect on is just how much schools in Queensland are using computers in their learning and assessment. This is a useful question for all sorts of reasons; is it true that there is massive and widespread use of computers in classrooms? Is it true schools are 'light years' ahead of the Board? Is it true that many students in Queensland are doing complex work in electronic formats that should be showcased digitally? Or is much of what Queensland students do with computers just wordprocessing?

Table 3 summarises the results of our five-minute telephone survey of a group of school subject-groups in Queensland. We took one or two of the highest enrolment subjects out of each Board subject category and randomly selected three school subject-groups for each of these 20 subjects. With only three schools per subject we'd expect that the addition of even one school might change the picture quite a bit for any one subject. Yet table 3 does give us a sense of what the picture might be across the whole senior school system. This table offers indicative (not representative) information of the extent to which learning and assessment is paper-based across the different Board subjects. It tells us that schools vary a great deal in the extent to which students use computers in their schoolwork, within subjects and across subjects. For example, one Biology teacher who said that his students use computers less than 5 % in their schoolwork said he had problems getting access; 'we don't have a computer in the entire science lab in the school'.

When reading table 3 it is worth bearing in mind that our questions were put to schools in such a way as to maximise the estimate provided by the teacher. That is, we asked not how much student work for assessment for the Board's moderation procedures is originally done in an electronic format, but rather simply how much schoolwork done in senior was completed in an electronic format.

Anyone who wants to argue that paper-based cultures are in the dark ages, and most learning and assessment are now digital, particularly in subjects where relevant workplaces make heavy use of computer technology, might find this small dataset interesting. For example, one Accounting teacher told us that all bookkeeping at the school is paper-based. When schools talked to us about use of computers they were more often than not talking about wordprocessing, not industry-specific computer applications. Where teachers referred to industry-specific applications of computer technology they were often referring to new areas of learning they were trying to develop in the school.

In short, table 3 suggests that if you removed wordprocessed assignments, and internet and CD-ROM research, you would probably be left with a very small percentage of student work across the system that is done in electronic formats. This has quite a few interesting implications for how atypical we see our own pilot school subject-groups as being, e.g. Helensvale SHS where substantial amounts of student work are done using industry-specific computer software that you probably can argue needs to be showcased digitally.

Table 3 shows that the three randomly selected Graphics school subject-groups are making limited use of not only the kind of computer applications that are featured in our pilot school submissions for Graphics, but of computers *per se* (5 % to 10 % of all schoolwork is in an electronic mode).

Accordingly, the view that student work needs to be showcased digitally to be properly showcased might apply to a restricted group of subjects and school subject-groups. That is an important point precisely because this argument is one of the more powerful ones for giving schools the option of making electronic submissions.

When teachers talk about the constraints on using computers they often refer to lack of resources, but they also sometimes refer to the limitations of computers. ('The better students are realising the limitations of the internet and returning to books and journals' observed one Geography teacher.)

Of course, the fact that most senior learning and assessment in Queensland is probably still paper-based and most of what is electronic are probably wordprocessed assignments does not mean that the Board's moderation procedures ought to be paper-based. Assessment standards can only be sound if they are based on assessment practices that give *all* students the best possible opportunity to show what they know and can do. At the same time, the observations made in this section about school practices are about the here and now: they also identify industry-based applications as a possible future growth area suggesting that the argument for electronic submission may well become stronger in the future, if it applies to other subjects such as Home Economics, or Legal Studies, or Mathematics.

Table 3 : Results of telephone survey of schools

Name of subject	*Rough % of all student work completed in an electronic format*	*Kind of student work involved*
English	75% – 97%	Wordprocessed work of every kind, including assignments, internet research, PowerPoint oral presentations
German	0% – 10%	Some research, internet interaction, email
Japanese	0% – 50%	Listening tests, reading activities, internet work, writing (with grammar checks)
Modern History	30% – 75%	Wordprocessed assignments, internet research, email
Geography	10% – 100%	Wordprocessed assignments, internet research, PowerPoint presentations
Legal Studies	25% – 40%	Wordprocessed assignments, internet and CD-based research
Mathematics A	5% – 40%	Wordprocessed major assignments, open-ended internet assignments, internet research, use of software for spreadsheets, internet stockmarket game
Mathematics B	5% – 20%	Graphs, spreadsheets for assignments, wordprocessed assignments, mathematics computer applications (e.g. for functions), internet research, graphics calculators
Chemistry	<10% to 30%	Graphs, practical reports, wordprocessed assignments
Biological Science	<5% – 20%	Wordprocessed assignments, practical reports, laboratory reports, identification activities involving CSIRO software package
Agricultural Science	5% – 20%	Wordprocessed assignments, internet research, database/spreadsheet work, computerised farm work (cattle weighing), computer applications for climate and other studies
Accounting	20% – 30%	Syllabus requirements for accounting packages, spreadsheeting, graphics, wordprocessed assignments
Home Economics	25% – 30%	Internet research, wordprocessed assignments, PowerPoint, developing use of electronic sewing machines
Graphics	5% – 10%	Limited CADDSMAN applications
Technology Studies	25% – 90%	Wordprocessed assignments, internet research, electronic class tests (in one group almost all student work scanned into electronic format)
Art	10% – 33%	Wordprocessed/PowerPoint assignments, internet research, Art computer applications (in one school only)
Study of Religion	33% – 60%	Wordprocessed assignments, internet/CD-based research, PowerPoint orals, Graphing
Drama	15% – 50%	Wordprocessed assignments, internet and CD-based research
Health & Physical Education	5% – 50%	Wordprocessed assignments, internet and CD-based research, computerised applications for collection of fitness (e.g. heart rate) data
Information Processing & Technology	40%	Assignment work (all kinds), developmental work

Schools' experiences: The preparation of submissions

Schools that do not make extensive use of electronic approaches to teaching, learning and assessment may experience considerable difficulty preparing an electronic submission

The experience of these pilot schools suggests that if you are making extensive use of electronic approaches to teaching, learning and assessment (as is the case with Graphics at Helensvale SHS where students are even examined electronically) then the process of submitting an electronic sample of student work is a natural evolution of what you are doing. If you are not a school where electronic approaches to teaching learning and assessment are happening then submitting any part or the whole of your submission electronically reduces you to an after-the-fact transfer of student work into an electronic format. This process of transfer with existing technology is potentially very problematic, as the following account of difficulties experienced by schools suggests.

Scanning presented particular problems for one of the school subject-groups (Brisbane Boys' College) that did this for the electronic part of their submission. It was also initially a problem for the other Art school subject-group which obtained good reproduction of student artwork using a digital camera. It was the key reason one other school originally intending to submit all work electronically subsequently withdrew from the pilot (even though they said they have 'high tech' scanners at the school).

The Brisbane Boys' College teacher involved commented that scanning of photographs for their Art submission was slow and cumbersome and 'in hindsight we should have had the negatives burnt onto a CD at the processing stage'. Yet it was also the view of this school that digital cameras do not produce good reproductions of students' artworks so it was necessary to produce the close-ups required for sound presentation of the work using scanned photographs. Beaudesert SHS observed that they restricted the electronic part of their submission to digital camera reproduction of the practical aspects of the subject (except for one student whose 'Appraising' work was scanned[7]) because scanning of theoretical work simply took too long.

The reproduction of student work in Graphics was less of a problem because the student work that was involved was for the most part *originally done in an electronic mode*. Yet Graphics teachers seemed to agree that line drawings present particular problems of reproduction whether they are scanned or whether they are reproduced using a digital camera.

Presenting student work in electronic folios introduces a whole layer of design that itself relies on considerable technical expertise

As one teacher commented, given that the design skills of the person preparing the electronic submission can really enhance the display of that student's work, it may be that we need equality of design expertise across schools if we are to have a level playing field for students.

The school that withdrew from the trial said that scanning was not only time consuming but the process of designing the submission to allow the panel to move

[7] It appears that this Appraising work was originally done electronically, printed out, submitted and annotated by the teacher, and then scanned.

through the electronic medium effectively represented a 'whole extra layer' of design work. This was the case whether the submission was on a website or in PowerPoint or any other electronic format.

The requirement for design presented by the electronic submission also occurs whether the student work has been originally done in electronic formats or not. Not all schools in the pilot found the design demands onerous (a glance at table 2 shows that some schools did create a more elaborate structure for their submission than others).Yet clearly a whole electronic submission (and to a lesser extent probably a part-electronic submission) requires a virtual structure, which involves creating links between elements of the structure.

Beaudesert SHS's Art submission appears to have the most complex structure: on the main contents page there are links to the work program, R6, and links to each student's work. On the contents page, given only for each student, there are links to the profile, R6, and links between student responses and the task sheet.

In an electronic medium, of course, design can be made problematic by technical problems. In designing their submission and the electronic folio, another school (Helensvale SHS) experienced considerable difficulty preserving hyperlinks in PowerPoint (the hyperlinks do work but only if the reader copies the submission to a C Drive which takes up both space and time).

The design demands of electronic submissions may be reduced by use of a template

This was the advice of the school that withdrew from the pilot and certainly this advice is consistent with the use of templates (some such programs are listed in the Bibliography) for electronic folios of student work in the United States. A template might help by expediting the placing and labelling of student work; generic across-subject templates might be modified for each subject. Not only that, but as one Art teacher pointed out, having a standard electronic format for submissions may help overcome an existing problem for some in our paper-based system; the 'presentation problems' found in some paper-based school submissions which make it hard for panels to do the job of verification.

Computer screens impose limitations of display of student work that might be partly overcome with specific design features built into the electronic submission

At least one Graphics teacher commented that the computer screen does not easily allow the viewer to see the fine detail (e.g. the thickness of lines) that characterise sophisticated student work. Another teacher of Graphics advised that electronic display of large drawings presented particular challenges. These challenges appear not to be restricted to Graphics, for a teacher of Art said that 'with artwork it is important to have a sense of scale', that the viewer needs to be able to 'zoom in' and that this had influenced the design features of the submission (in this case photos were scanned to produce the necessary detail). A second Art teacher said that close ups of individual paintings were an important part of electronic display of the detail of the artwork.

Obviously, projectors can offer one way around the problem of seeing an image that is not properly displayed in 'computer screen size', but the evaluation did not offer any information about the reproduction problems with this technology.

In future, students might be engaged in designing their own electronic folios

This suggestion was made by at least one teacher who said that, in future, Art students could prepare their own folio with links within a standard format. However, the argument presented by this teacher — that design of the folio e.g. page and background design, is an artistic endeavour that can be included as a substantive aspect of what Art is about — may not be one that can be applied to other subjects as they are presently constituted.

If students work in different electronic formats schools may have problems making their work accessible to panels; not only that but moving through the submission may require high levels of computer literacy

This point was made by one teacher (Helensvale SHS) that submitted its whole Graphics submission electronically as the natural evolution of extensive use of electronic approaches to teaching, learning and assessment. The point can be demonstrated with reference to the school's experience of movie files. Students creating movie files are asked by this teacher to save work in formats that are compatible with common 'players' such as 'Quicktime'. Yet even if the work can be made accessible to panels in this way, the teacher points out that a panellist trying to access a movie file in PowerPoint cannot do this unless the panellist knows to go into Windows Explorer and open the file through Quicktime.

Making judgments about student work created and assessed in electronic formats may require high levels of computer literacy on the part of the school assessor and the panellist

Graphics teachers said that the complexity of design work in electronic formats resulted in an apparent simplicity of appearance that could mislead panels (and vice versa; i.e. simple work may suggest a more complex achievement than is the case). It would seem that, in Graphics at least, and where the end product is created by the student in a particular software package, making the same kind of judgments about electronic copy that schools and panels now make about student work in hard copy requires a level of computer literacy that goes beyond those skills that allow a person to simply move through the submission. According to the Graphics teachers in this pilot, the person making the judgments needs to know the software package to understand how the student has applied the subject knowledge and skills.

The Board may need to specify detailed requirements for presentation and storage of any future electronic submissions

The schools involved in this pilot study proceeded with certain specifications; for example, that work had to be presented in PowerPoint. The specifications were few and easy to comply with. Larger-scale electronic submission of student work will probably require more detailed specifications and standardisations (for example, for the display of large images so that no students are disadvantaged by design features of the electronic submission). One teacher also indicated that the Board might need to think about specifying some basic requirements for the electronic storage of student work. For example, hard copy is subject to natural disasters like flood or fire or (much more improbably) theft; but electronic copies, if not properly backed up and secured, can be subject to the unnatural disasters of viruses and computer vandalism.

If the nature of your subject has meant you've had some difficulties submitting your student work in hard copy, you may well see the resources required to prepare the electronic submission as a sound investment

It needs to be emphasised that subjects like Art have always had particular problems of reproduction in hard copy that seem alleviated or even entirely resolved by submitting work electronically. This may have made the two Art teachers in our pilot particularly willing to consider the resources expended in preparing their submission as a good investment, even though they had to digitally photograph work, or scan photographs.

For example, the Beaudesert SHS Art submission took *a hundred hours* to prepare, most of which went into the design of links in PowerPoint as well as scanning. Yet in the view of this teacher, this was time well spent in helping overcome problems of storing and carrying student work in Art in the long term (opening up possibilities of allowing students to take their work home at the end of the year, and allowing teachers to more easily share exemplars of student work). Previously, this school had taken photographs of student work and developed these, with substantial costs in film processing (around $120). The point for this teacher is that once the design links are created they can be reused, much like a template, so that preparation of the submission in subsequent years might even take less than the normal six hours it takes to prepare the paper-based school submission, especially if a digital camera is used for electronic reproduction of student work, rather than scanning technology. He felt that after an initial outlay (of $1200) for a digital camera that can be used for other purposes in the school, there is very little cost of reproduction of student work using this method.

Graphics teachers may also be a highly motivated group when it comes to considering time spent on their electronic submission as time well-spent overcoming the problems caused by the sheer weight and size of their paper-based submissions. The time and cost of preparing submissions for these pilot school subject-groups relates not so much to scanning as to design of the submission, but the sense in their comments is that electronic submission is not resource-intensive relative to paper-based submissions. In fact, paper and printing for computer-rendered drawings is prohibitively expensive (around $2 a sheet). That is, if a student work is originally done electronically, and design of the submission is standardised, then the overall cost of submitting this work on hard copy may actually be higher than the cost of electronic submission of the same work.

One school estimated that, because they like to print out their students' Graphics drawings for the purposes of assessment, having student work in electronic formats is in the end about as costly as not working in electronic formats (leaving aside considerations of software and hardware costs, and time spent designing the submission).

Not surprisingly, across all the pilot schools, it was clear that these schools could only participate in this pilot because they had and knew how to use the necessary hardware and software. A digital camera could be considered a basic tool for this exercise.

Schools' experiences: Effects on teaching, learning and assessment

While the pilot schools were positive about the advantages to students of electronically based approaches, electronic submission does raise complex questions about equal opportunity

The pilot raised some intriguing questions about equal opportunity that demonstrate that the complexities of achieving a level 'virtual' playing field for students is going to involve some further work and reflection.

When discussing the challenges of equal opportunity in education presented by computers it is worth making the distinction between student work *created* in an electronic mode and student work *scanned* into an electronic mode. The issues of equal opportunity are not quite the same in each case. For example, as we have seen, scanning student work into electronic modes involves the question of how well this work translates into an electronic format, as well as whether the teacher involved in preparing such a submission has the necessary skill to optimally display the student work. Student work originally produced electronically raises this last question of equal opportunity of display, certainly, but also the question about whether the computer as a medium has given students the best possible opportunities to demonstrate what they know and can do in the first place.

By and large, teachers in this pilot argued that computers give students better opportunities to demonstrate and showcase their skills than cumbersome pen-and-paper modes of assessment. Not only that, but Graphics teachers seemed to put the argument that computers challenge students to produce at ever more sophisticated levels, and offer academic high achievers real scope to excel. One Art teacher said that computer technology can 'speed up processes' by allowing students to develop design ideas in a 'low risk' experimental medium that does with the 'click of a button' what may take hours to do by hand.

Different groups of students relate very differently to computer technology and are differently advantaged and disadvantaged by it

Any decision to give schools the option to submit student work electronically for verification may well have the effect of increasing the emphasis on producing student work in electronic modes. Indicative comments from teachers in this pilot suggest that different groups of students relate to, and are affected by, computer technology in very different ways. Yet it was the view of teachers in this pilot that all students can benefit from the ease with which computer technology can disseminate their work, previously held by the school until well after they had left senior.

Not only that, but teachers said that computers seem to offer Queensland students the kind of advantages described in our review previously, namely encouraging 'non-traditional' classroom practices. As described by one teacher, computer-based approaches offer opportunities for self-paced learning that encourage a peer group climate of excitement for learning; this self-paced learning extends a continuous challenge of a kind not so easily offered when the student is more dependent on the teacher to lead them through the steps of learning; the whole approach 'frees up teacher time' allowing greater support for those in the group who most need it. Yet teachers also spoke of an undifferentiated group that 'still struggles' with computer technology (for example, in Graphics these students may perform well on the drawing board).

Teachers in this pilot made the following sorts of observations:

- As a group, girls may not be as skilled on computers as boys[8]. One teacher pointed out that because the computer games industry has targeted boys, his male students enter senior with higher-level computer skills than girls. For this teacher this means that while his female students have 'plenty of original concepts', they lack the computing skills to realise these and require 'step-by-step guidance'.
- In Graphics, computer-based approaches seem to challenge boys in particular to engage with the subject and produce very sophisticated work: there is a sense in teacher comments that every generation of senior students is more advanced than the next, and that virtual reality is becoming the preferred creative medium of communication for many young people, particularly boys, including those boys who have not experienced much success in junior studies. Teachers linked this success of boys to the opportunity provided by electronic formats to move away from traditional 'pen-and-paper' modes of assessment into 'real-world' or authentic assessment (as a number of teachers pointed out, the CADDSMAN software programs being used are industry standard architectural design programs). In fact, the computer-based skills in design being acquired by these students opens up in their eyes and the eyes of their teachers a whole range of post-school pathways to do with computer-based design.
- Computers may give some students with disabilities a more level playing field: teachers in this pilot who have experience teaching students with disabilities said that computers help overcome disabilities that affect manipulative skills, allowing these students to achieve work with sophisticated presentation. One teacher claimed computer technology gives these students 'hope that they can realise their ideas'. Another Graphics teacher said that in the 1990s 'a brilliant student' with muscular dystrophy had 'taken the school forward' by pioneering new approaches with design software, opening up 'a whole new world of design' that could be taught to other students. Yet another teacher qualified all of this by pointing out that computers help overcome barriers to do with gross manipulative skills but not fine motor skills. A fourth Graphics teacher in this study (who teaches students with disabilities) made the point that the traditional apparatus of Graphics was more problematic because while 'a student who can't use a mouse can use a keyboard', traditional tools of design in the subject often had to be held and manipulated three at time. Clearly, a very broad range of disabilities exist in the senior population of students with disabilities, and the extent to which a computer can help overcome barriers or represent a barrier in itself is about the specific nature of the disability for a particular student. For example, one Graphics teacher said that a student with a sweating disorder had been greatly helped by computer-based technology, which enabled him to overcome the frustrations of working with paper and the traditional tools of the subject.

The comments of one teacher seem to capture the flavour of these teachers' comments. He said that what is true of the design of pen-and-paper assessment by

[8] We could also speculate that the group of teachers who are technology boundary pushers in particular subjects is a group with quite a different ration of males to females than can be found in the wider Queensland population of teachers. Certainly, all the teachers for the pilot school subject-groups in this study are male.

teachers is also true of the design of electronic assessment: 'it is up to the teacher not to design assessment that disadvantages students.'

Panels' experiences: the mechanics of verification

For most panellists, it was at least as quick to prereview/review submissions in an electronic format as it was to deal with the same amount of paper-based work

The general consensus of panellists is that panels could do the job at least as quickly with the electronic parts of submissions as they could with paper-based student work. This appears to be because of the time taken by 'shuffling large pieces of paper' as one Graphics pre-reviewer noted. It was true even for those panels who felt the electronic submission could have been better designed.

When considering the time factor it is worth noting that pre-reviewers generally said that the speed at which they worked with the electronic submission was related to the fact that they knew and understood the design software that had been used by the student.

One pre-reviewer (of the Helensvale SHS submission) said the electronic submission took longer than a paper-based submission would have done because the CD should have been downloaded to hard drive (to allow hyperlinks to work) but was not because of lack of space, thus slowing the viewing process down.

However, although the relevant pre-reviewer had no difficulties doing the job, the District Review Panel Chair for Art could not look at the website for Brisbane Boys' College on the day of verification because the website was 'down'. This meant that the panel relied on the hard copy of the submission (this school was the only one that submitted hard copy as well). As she noted, technical problems can entirely prevent a submission from being viewed, and without the hard copy the panel would have had no submission to look at for verification. Still, she noted the submission was quite well organised and the panel had 'little argument' with the sampling positions (this was true for all school submissions in this pilot: the Forms R6 do not suggest concerns about standards).

Electronic submissions or parts of submissions seem to offer ease and convenience for those panels who are accustomed to dealing with single school submissions of up to 20 kg in weight

This is an important part of the story why panellists in these two subjects appeared to see electronic submissions as advantageous.

The District Review Panel Chair (DRPC) for Graphics for the Gold Coast expressed this view along with his pre-reviewers; all four of the Graphics school subject-groups involved in this pilot submitted work seen by his panel. The bulk[9] of Graphics and Art submissions was a recurring theme in comments about the advantages presented by electronic submissions (in the comments from panels and schools alike). Bulk is an issue not only because it creates storage and handling problems but because, as a number of panellists commented, electronic submissions allow them to peruse the submission anywhere, anytime (e.g. at home). In Art, one panellist said that bulk prevents the kind of networking and sharing of student work between schools that electronic submission at verification

[9] There will be arguments about the necessity of this bulk from different subject experts!

should encourage:

The best in-service is to see what other teachers are doing. Good in-service is difficult to get in Art. There are regional exhibitions and so on, but there is little opportunity to share and exhibit student work in a time-efficient way that, for example, the display of student work on school websites offers for busy teachers to look at during their lunchtimes.

Yet this ease of dealing with electronic submissions may have been influenced by the highly motivated panellists and schools involved in this study: for example, the Gold Coast meeting was carefully set up before, with some thought having been put into practical arrangements for the meeting[10]. Not only that, but as the DRPC commented, the schools involved were 'supportive of the concept' and had gone to some trouble to present 'quality submissions'.

A template would help make pre-reviewing/reviewing electronic submissions easier, particularly if it standardised requirements for links between student work and assessment information in the submission

All four Graphics pre-reviewers, as well as both of the Art pre-reviewers[11], noted similar needs for better links between student work and other pieces of assessment information in the submission. Yet these comments were offered by way of reflecting on improvements to future electronic formats; no panellists offered these observations as serious problems.

One pre-reviewer of a Graphics submission noted that a template would help panels move through the submission, standardising the design of the submission, including any necessary links. He suggested that links between the criteria sheet and the student work would be helpful in future such submissions (even if it was only an image of the criteria in one corner of the screen). This point was made by another pre-reviewer who added that links between student work and criteria sheets, profiles, and assessment instruments were needed in the submission he looked at. Yet, at the same time, the former pre-reviewer also expressed the view that it was important that schools have scope to put their 'individual stamp' on their submission.

Another pre-reviewer of Graphics who found himself unable to 'zoom in' on student work said (after noting the not so well structured and labelled nature of the submission) that 'submissions must have clear navigation to reduce potential disadvantage to students' as well as other standard features like zooming in facilities. Without this standardisation he saw potential equity issues because the presentation of electronic submissions would rely too much on teacher expertise in electronic design. Even a submission attracting high praise from the pre-reviewer for its quality and presentation (from Helensvale SHS) still in the pre-reviewer's mind had scope for improvement in this area. This pre-reviewer noted that he had to shuffle through hard copy to find the assessment criteria, when 'built-in' electronic links to the student work would have been more convenient.

The observation has already been made that the Beaudesert SHS Art submission reflects long and patient hours of design. Yet the Art DRPC for the Gold Coast

[10] The Art DRPC for the Gold Coast commented that having enough computers at the verification venue was 'the only difficulty'.

[11] The pre-reviewer for Brisbane Boys' College, which was a website submission, noted that the submission did not initially include the R6, student profile and appraising task assessment sheets.

noted that 'better labelling' of the Beaudesert SHS submission would help the pre-reviewer 'be sure what work related to what standard.' One other interesting comment made by this DRPC was that electronic submission may 'impose a structure' on the material schools submit, in a context in which schools sometimes submit 'enormous visual diaries that panels have to look through'. This comment seems to raise the question whether use of a template may help schools be more selective (perhaps, though, the need to scan student work might be the cause of this selectivity). The pre-reviewer of the Beaudesert SHS Art submission also noted that because the visual diary was linked to the end design product as a design feature of the submission, this certainly made the submission easier to pre-review because she didn't have to 'go fishing' through the visual diary to find the documentation of the development of a piece of work.

In this pilot, pre-reviewers did not have to print the electronic submission

This was the consensus among panellists and it appears that this is partly because the electronic presentation of student folios worked reasonably well and partly because, as one pre-reviewer noted, 'printing out wouldn't have given better resolution'. One Graphics pre-reviewer commented that the facility to 'zoom in' made printing any part of the submission unnecessary (as we have seen, another said it was not possible to 'zoom in' in on the PowerPoint submission). Another noted that he was able to flick through different 'rendered' images on a screen offering better resolution (up to 200%) of the image in around the time it took to look at one or two printed images which would in any case have had poorer resolution (and would have been costly).

The two pre-reviewers for Art were also able to rely solely on the electronic version of the submission. The pre-reviewer for Beaudesert SHS noted that the electronic images were 'wonderfully clear … better than [they would have been] in hard copy.' She was positive also about the ease of reading the written work included in the electronic submission for one student (the Appraising Unit); in fact, she felt the school might have included even more written work than it did.

The pre-reviewing checklist seemed to work about as well for electronic submissions as it did for paper-based submissions

Pre-reviewers had no other observations to offer on this matter. However, one pre-reviewer noted that while the form 'worked as well as it always has' she 'didn't like it' because the form 'has nowhere to put positive comments, which could be particularly important for electronic submissions.'

Technical expertise is a precondition of the mechanics of verification working well where electronic submissions are involved

This view is something of a theme in comments from Graphics panellists in particular. As the previous discussion might suggest, there are two ways in which technical expertise is important to the mechanics of verification working well for an electronic submission:

- simply moving through an electronic submission requires a basic level of computer literacy
- to understand the student's achievement in creating an apparently simple electronic design or an apparently complex design the panellist must know the software in which that design was created (this was generally the case in

this pilot for Graphics) — without this technical expertise, the act of flicking through the submission is not one of recognising ways in which students have demonstrated particular knowledge and skills, it becomes a slower one of trying to understand (usually by seeking advice from other panellists) the nature of the student's achievement against the criteria for that achievement.

One Graphics pre-reviewer expressed the view that, before electronic submission of student work could go ahead on a larger scale, panels would need to be trained to a certain level of technical expertise (which in his subject he did not see as prohibitively high).

Some panels may be highly motivated to work with electronic submissions in their meetings because of what they see as the wider perceived benefits for students, their subject, and Board procedures

Panellists involved in this study were generally highly motivated and apparently quite highly computer literate. This may have made them more tolerant of things that did not go so well (like the links between different parts of the submission).

For example, while the pilot went reasonably well, it may be that minor inconveniences of the kind mentioned in this report (that actually happened) and major inconveniences (that didn't happen for Graphics but did for Art with a website 'going down') could only ever represent speed bumps to this group. This may be because panellists seemed to agree on certain strong advantages for students and their subject. Some panellists even felt that the benefits, to the Board, of electronic submissions were considerable, for example, easy duplication of student work for our random sampling procedure (and any other procedures requiring speedy submission of student work).

Yet we cannot assume that all panels in all subjects will be so motivated. That is, if in Art and Graphics the issues of reproducing student work are there anyway (printing out designs done in electronic formats in Graphics, photographing student works for Art), perhaps the advantages weigh more heavily than they might do in other subjects.

For example, and particularly in Graphics, panellists seem to feel that electronic submissions would, by moving practices forward:

- increase the rigour of the subject[12], providing students with better opportunities to show their strengths and weaknesses
- increase student participation
- improve the relevance of subject content to the workplace.

The DRPC for Graphics involved in this pilot noted that it had offered schools a 'tremendous learning curve' in which they had to actively find solutions to the electronic display of their students' work for the purposes of verification.

The Art panellists appeared similarly motivated to manage the difficulties they experienced. For example, the pre-reviewer for the Brisbane Boys' College Art website submission noted that the submission did not offer very clear reproduction of student work but she commented positively about the whole experience.

[12] One pre-reviewer noted that there was 'a worry that the higher level process skills were being lost' in Graphics a few years ago but, in his view, the use of computers was allowing Graphics to gain more of the territory of complex higher level thinking skills for its students.

Panels' experiences: Determining standards

The same strategies used to establish the authenticity of paper-based design work can be used to establish the authenticity of virtual designs

Panellists generally observed that paper-based designs present the same problems of authenticity as virtual designs. The solution in the minds of those involved in this study in both Art and Graphics appears to be to document the process by which the design was created so that the evolution of the finished product can be traced. As a Graphics pre-reviewer said, presenting computer-created images without the supporting documentation of how the design was created is 'no different to ink drawings without the rough notes and workings.' One DRPC for Art noted that authenticity in this subject is 'secured by the visual diary of the student work that records the creation of the works.' An Art pre-reviewer noted that, in any case, 'we haven't been sending actual work to verification for some time, so there is no more of an authenticity problem with the electronic submission'.

This does not mean that panellists in this pilot do not see authenticity as a potential problem; they do. The point is that they recognise the issues, but they do not see authenticity as a barrier to electronic submission working well. As one pre-reviewer noted after saying that her own students produce a lot of computer generated artwork:

> This is a nebulous area but the teachers' professionalism needs to be relied upon. The use of clipboard art and so on is very obvious. But at the same time, students become more sophisticated every year in their use of computers. I'm teaching my Year 8 students computer skills that I would have taught Year 12 students two years ago. We need panels with the same high level of computer skills.

It is also evident that panellists have reflected on security devices for electronic assessment both as panellists and as teachers. One Graphics pre-reviewer noted that all examinations in his school subject-group were done electronically and included such mechanisms as students only being able to save work in their home drive. Another pre-reviewer noted that Graphics work with distinctive regional and individual student relationships was 'difficult to fake.' One Art panellist noted that digital artwork can be more easily documented as it is created.

Panels generally see high-level computing skills as helping students realise their concepts, but they generally agree that high-level computing skills cannot give the illusion of high-level process skills

This is an important observation to make in response to the question 'Does the electronic submission mean that it is difficult to determine standards because it is not so easy to decipher the difference between computer skills and other key skills?'

While panellists seemed to agree that high-level computer technology skills are becoming increasingly what the Graphics subject is about, they also emphasised that no amount of computer literacy could act as a substitute for the more complex abstract process skills required to do well in Graphics. The qualifier is that this is particularly true if the viewer of student work knows the software capabilities. As one pre-reviewer said: 'being good with computers doesn't mean a student has good spatial concepts; use of computers may make it easier to develop a perspective view in design but the student still needs to be able to select and manipulate those perspectives conceptually.'

Yet one pre-reviewer in Graphics noted that 'as much as presentation is separated out in the mind of the panellist, it still has a subliminal effect.' He pointed out that this is an issue because while some students will put many hours into professional standards of presentation of their designs, others have limited access to 'fancy software programs' with 3D design.

Panellists in this study generally agreed that electronic formats give students more and better opportunities to demonstrate what they know and can do

This view is based on reasons similar to those given by schools for the advantages for their students of electronic formats; electronic formats offer opportunities for self-paced learning such that the work of outstanding students in Graphics, for example, seen by panels emerges out of highly technologically competitive peer-group learning environments.

Not only that, but the argument put forward by at least one Graphics panellists in this study is that 'if work was originally done in a digital format, then it needs to be showcased digitally or the quality of the work is lost.' He gave the example of 3D animation.

Art panellists were generally a bit more cautious. For example, the pre-reviewer for the Brisbane Boys' College Art submission disagreed that the electronic mode did not provide more and better information on which the panel could base its advice to the school: 'not at this preliminary stage'. That may well have had something to do with the quality of reproduction of student work allowed by the scanning process used.

PowerPoint may be a useful initial format to use for a wider trial but there are other options to explore

The Gold Coast Graphics DRPC said that the PowerPoint format worked well as a common format, given that each school chooses its own software, and it is often not the same between schools. He also said that the internet was another option worth exploring.

One of the Graphics pre-reviewers noted that one school submission seemed 'rushed' because the program used for drafting would not 'upload' into PowerPoint, and the school had to take digital photographs; this reduced the amount of time they perhaps had for design aspects of the submission. For this reason perhaps, this panellist preferred the website as a format for submitting student work. A third panellist said he felt the internet offered advantages over PowerPoint, particularly as it related to the reproduction of video files.

Yet, not surprisingly, the Art DRPC who was unable to access the submission from Brisbane Boys' College noted that she would now 'prefer a CD'.

CONCLUSIONS

The study findings support further *cautious* development by the Board of its verification procedures. The broad findings of the study are as follows.

- The survey of interstate practices suggests that some other Australian authorities do allow schools to submit work electronically for the purposes of moderation in particular subjects.
- There is an argument to be made that work done originally in electronic formats, notably work done using industry-specific computer applications, is best showcased electronically.
- It is likely that in some subjects, schools and panels are highly motivated to make electronic submission for verification work.

The findings suggest the value of the following directions.

1. Conduct a restricted trial of electronic submissions for verification for a selected group of subjects and schools in 2001 which should include Graphics, Information Processing & Technology, and Art at least; this trial should be evaluated and the results presented to the Board's Moderation Committee
2. Establish a standing group on technology use in the Board's moderation procedures to assist the Board; this group should include teachers from at least Graphics, Information Processing & Technology, and Art
3. Develop a template offering a standardised format for electronic submissions for verification (either through the proposed standing committee for technology in moderation procedures, or using some other mechanism).

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APPENDIX 1 : SEMI STRUCTURED INTERVIEW FORM FOR USE WITH SCHOOLS PRIOR TO VERIFICATION

(for use by researchers only i.e. to help structure interview with school)

Copy of electronic submission received? ❑ *YES* ❑ *NO*

Name:

School:

Subject:

Description of electronic part of school submission

What was submitted electronically in your submission i.e. what pieces of student work, for how many students, at what levels of achievement?

What are the school's reasons for making these particular aspects of the submission available electronically?

Can you describe the format (e.g. PowerPoint) and any special issues that relate to this particular format i.e. advantages/disadvantages?

What are the key features of the design of the submission? Please describe any electronic design issues for you as a school.

Write any other observations about school submission here

Preparation

What steps did you take to make the electronic submission happen at your school i.e. what procedures and processes did you use?

Did preparation of the electronic submission take longer than you think would have been the case with a paper version of the same submission?

What costs were involved in preparing your submission electronically (compared with the usual cost of a paper submission in the same subject)?

Effects on teaching, learning, and assessment

Does the electronic mode offer specific advantages for teaching, learning, and assessment? If so, what advantages? (include any actually occurring advantages for your school as well as potential advantages) (answer where possible with reference to specific aspects of the electronic parts of the submission)

Does the electronic mode present any barriers to teaching, learning, and assessment (students showing what they know and can do)? If so, what barriers? (include anything that actually occurred as well as potential issues) (again, answer where possible with reference to specific aspects of the electronic parts of the submission)

What do you think were the effects on your student's experience of the subject? How do you think electronic submission of their work this year affected their experience of the subject? Having had this experience, what potential effects on students do you forsee in the electronic mode of submitting student work for verification?

What potential advantages and disadvantages do you forsee for students with special needs in the electronic mode of submitting student work for verification?

Do you have any other observations to make about how well the process worked for your school?

APPENDIX 2 : DISTRICT REVIEW PANEL CHAIRS

Pilot evaluation study of verification by electronic submissions

Memory jogger to use when we contact you later about the process of reviewing electronic submissions:

Your name: _____

Name of school making electronic submission: _____

Subject: _____

Thank you for agreeing to participate in this pilot study of the process of reviewing electronic submissions. We know you are busy at this time of year, and we know you may or may not have read the electronic submission/s so please jot down only answers to those questions on this form that you have time to answer, and can answer.

Background

With so much information going into electronic format it is important that the Board's procedures keep abreast of technological changes happening in schools. In 2000 the Board has approved a pilot study involving seven schools submitting their student work electronically. Three subjects are involved (Art, Graphics, and Information Processing & Technology). The aim of the pilot study is to provide indicative information about how well electronic formats for student folios work at verification for schools and for panels.

Purpose of this form

To help us complete this pilot study, we are asking DRPCs to make some notes during verification that can act as a useful 'memory jogger' when a Board research officer contacts you later in the week of verification to speak for thirty minutes or so about how well electronic submission of these student folios worked during the verification process.

In short, we'd like you to make some notes on this form so we can talk to you later on the phone. Together with data from panellists doing the pre-reviewing of the electronic submission/s[13] and other data from participating schools, the information you give us will help produce a short report to the Board's Assessment, Moderation and Technology Working Group.

What do I do?

Write your brief *rough* notes in the boxes below. You do not need to answer the questions completely; that can happen when we contact you by phone. We are ***not*** asking busy persons like yourself to spend any time writing up your notes; we are happy to have rough notes and your verbal comments on the phone when we contact you. These notes are only memory joggers for you to use (and for the Board agent to fax a copy to us on the day of verification). For the purpose of making these rough notes, you can seek advice from anyone else on your panel who has read the submission and is available and willing to give you their thoughts.

[13] We have asked the panellists doing the pre-reviewing of the electronic submission/s to fill in a different form.

District review panel chairs

Mechanics of verification

Tell us about anything you observed to do with how and why the electronic submission seemed to affect the mechanics of verification (i.e. whether the electronic submission seemed to slow things down/speed things up and why, etc.).

Having been involved in verification of an electronic submission, what demonstrated issues (in this meeting) and potential issues (i.e. advantages and disadvantages) with verification procedures do you see as a DRPC?

District review panel chairs

Determining standards

As DRPC, were you aware of specific difficulties (e.g. to do with determining standards, determining authenticity of student work, validity of assessment) in pre-reviewing/reviewing that related to the electronic mode used?

Did the electronic mode provide more and better information on which the panel could base its advice to the school?

District review panel chairs

Overall

If you read the electronic submission, what changes to the electronic submission (format etc.) would have worked better for the verification process? Why?

The Board agent will make a copy of this filled-in form to fax to us on the day of verification.

Please keep the original of this form so that you have it by you when a Board researcher contacts you soon by telephone.

Thank you for your assistance.

For any queries please do not hesitate to contact

(Dr) Erica Bell
Manager (Policy and Evaluation)
PO Box 307
Spring Hill QLD 4004
Tel: 3864 0267
Fax: 3221 2553
Email: office@qbssss.edu.au

APPENDIX 3 : PRE-REVIEWERS

Evaluation of pilot electronic submissions for verification

Memory jogger to use when we contact you later about the process of reviewing electronic submissions:

Your name: _____

Name of school making electronic submission: _____

Subject: _____

Thank you for agreeing to participate in this pilot study of the process of reviewing electronic submissions.

Background

With so much information going into electronic format it is important that the Board's procedures keep abreast of technological changes happening in schools. In 2000 the Board has approved a pilot study involving seven schools submitting their student work electronically. Three subjects are involved (Art, Graphics, and Information Processing & Technology). The aim of the pilot study is to provide indicative information about how well electronic formats for student folios work at verification for schools and for panels.

Purpose of this form

To help us complete this pilot study, we are asking pre-reviewers to make some notes during verification that can act as a useful 'memory jogger' when a Board research officer contacts you later in the week of verification to speak for thirty minutes or so about how well electronic submission of these student folios worked during the verification process.

In short, we'd like you to make some notes on this form so we can talk to you later on the phone. Together with data from the DRPC[14] and other data from participating schools, the information you give us will help produce a short report to the Board's Assessment, Moderation and Technology Working Party.

What do I do?

Write your brief *rough* notes in the boxes on this form. You do not need to answer the questions completely; that can happen when we contact you by phone. We are ***not*** asking busy persons like yourself to spend any time writing up your notes; we are happy to have rough notes and your verbal comments on the phone when we contact you. These notes are only memory joggers for you to use (and for the Board agent to fax a copy to us on the day of verification). For the purpose of making these rough notes, you can seek advice from anyone else on your panel who has read the submission and is available and willing to give you their thoughts.

[14] We have asked your district review panel chair to fill in a different form.

Pre-reviewers

Mechanics of verification

Did the electronic submission take longer to review/pre-review?

Were you able to pre-review/review the submission entirely on screen, or did you have to print out parts? Which parts and why?

Having been involved in verification of an electronic submission, what demonstrated issues (in this meeting) and potential issues (i.e. advantages and disadvantages) with verification procedures do you see as a panellist?

Pre-reviewers

Determining standards

Were there specific difficulties (e.g. to do with determining standards) in pre-reviewing/reviewing that related to the electronic mode used?

Did the electronic mode provide more and better information on which the panel could base its advice to the school?

How well did the pre-reviewing checklist work for electronic submissions?

Having been involved in verification of an electronic submission, do you see any demonstrated (in this submission) or potential issues of authenticity of student work?

Considering the experience of verifying an electronic submission, what demonstrated and potential issues of validity of assessment do you see (i.e. does the electronic mode affect the extent to which assessment situations actually assess what on face value they purport to assess?)

Pre-reviewers

Overall

What changes to the electronic submission (format etc.) would have worked better for the verification process? Why?

How would you describe the overall experience of verification of the electronic submission (i.e. advantages, disadvantages, how worthwhile you felt it was, how much you enjoyed it etc.)?

The Board agent will make a copy of this filled-in form to fax to us on the day of verification.

Please keep the original of this form so that you have it by you when a Board researcher contacts you soon by telephone.

Thank you for your assistance.

For any queries please do not hesitate to contact

(Dr) Erica Bell
Manager (Policy and Evaluation)
PO Box 307
Spring Hill QLD 4004
Tel: 3864 0267
Fax: 3221 2553
Email: office@qbssss.edu.au

APPENDIX 4 : RANDOM SAMPLE OF SCHOOL SUBJECT-GROUPS FOR FIVE MINUTE TELEPHONE SURVEY OF STUDENT USE OF COMPUTERS IN SCHOOLWORK

	Subject name	*School*	*School name*
1	English	78	St Hilda's School
1	English	444	Glenmore State High School
1	English	536	St Margaret Mary's College
6	German	50	Loreto College
6	German	129	Laidley State High School
6	German	177	Corpus Christi College
9	Japanese	17	John Paul College
9	Japanese	150	Carmel College
9	Japanese	424	St Patrick's College, Gympie
21	Modern History	3	Holland Park State High School
21	Modern History	8	Woodridge State High School
21	Modern History	305	Warwick State High School
24	Geography	17	John Paul College
24	Geography	25	St Laurence's Christian Brothers College
24	Geography	491	Pioneer State High School
29	Legal Studies	66	Benowa State High School
29	Legal Studies	205	Redcliffe State High School
29	Legal Studies	405	Kingaroy State High School
36	Mathematics A	116	St Peter's Lutheran College
36	Mathematics A	485	Bowen State High School
36	Mathematics A	522	Thuringowa State High School
37	Mathematics B	33	Cavendish Road State High School
37	Mathematics B	69	Nerang State High School
37	Mathematics B	239	Lockyer District State High School
40	Chemistry	424	St Patrick's College, Gympie
40	Chemistry	520	Pimlico State High School
40	Chemistry	540	Townsville Grammar School
42	Biological Science	25	St Laurence's Christian Brothers College
42	Biological Science	59	King's Christian College
42	Biological Science	601	Mount St Bernard College
51	Agricultural Science	61	Beenleigh State High School
51	Agricultural Science	255	Downlands Sacred Heart College
51	Agricultural Science	559	Columba Catholic College
60	Accounting	469	Rockhampton Girls' Grammar School
60	Accounting	471	St Brendan's Christian Brothers College
60	Accounting	488	Mirani State High School
71	Home Economics	62	Keebra Park State High School
71	Home Economics	130	Lowood State High School
71	Home Economics	220	Sunshine Beach State High School
76	Graphics	304	Stanthorpe State High School
76	Graphics	467	Chanel College
76	Graphics	593	Atherton State High School
78	Technology Studies	42	Alexandra Hills State High School
78	Technology Studies	73	All Saints Anglican School
78	Technology Studies	582	St Augustine's Marist Brothers College
80	Art	15	Shailer Park State High School
80	Art	19	Brisbane Adventist College
80	Art	516	Ayr State High School
86	Study of Religion	173	All Hallows' School
86	Study of Religion	225	St Joseph's Nudgee College
86	Study of Religion	476	Emmaus College
88	Drama	70	Runcorn State High School
88	Drama	128	Ipswich State High School
88	Drama	229	Burnside State High School
90	Health & Physical Education	73	All Saints Anglican School
90	Health & Physical Education	133	Redbank Plains State High School
90	Health & Physical Education	229	Burnside State High School

Phone form for five minute telephone interview with schools about student use of computers in schoolwork

The Board's Policy and Evaluation Section is currently collecting some information about the extent to which senior students are using computers in their schoolwork. This information will be helpful background information to some ***exploratory*** research now being conducted by us into how developments in the use of technology might affect our procedures (such as verification). We will not use your individual details; we are only trying to get a feel for what is the case for a number of randomly selected school subject-groups. I want to ask you only one or two quick questions that should take less than five minutes of your time to answer. Are you happy for me to do so now?

Teacher :
Subject :
School :

Q.1 What proportion of your students' work is completed in an electronic format i.e. if you were to weigh all the work a typical student did in your subject from Years 11 to 12, what proportion would have been done by the student in an electronic format?

Q.2 Can you give us a very broad description of the kind of work involved (e.g. major assignment about xyz which involves students doing abc)?

APPENDIX 5 : PHONE FORM FOR FIVE MINUTE TELEPHONE INTERVIEW WITH AUSTRALIAN CURRICULUM ASSESSMENT AND CERTIFICATION AGENCIES

The QBSSSS Policy and Evaluation section is currently collecting some information about the extent to which similar agencies are allowing senior students to submit work in electronic formats (whether for public examinations or for school-based assessment). This information will be helpful background information to some ***exploratory*** research now being conducted by us into how developments in the use of technology might affect our procedures. We only want broad information to give us a feel for what is happening across Australia in different systems. I want to ask you only one or two quick questions that should take only a few minutes of your time. Are you the best person to answer these questions?

Staff member:

Role:

Agency:

Q.1 Do students in your state submit work in electronic formats as part of their school-based assessment or public examinations?

Q.2 If so, please give a very broad description of the kind of work involved (e.g. major assignment about xyz for moderated school-based assessment, or interactive examination in the subject abc)?

Q.3 Can you give me a broad description of how your organisation's procedures for looking at student work (such as examinations procedures and moderation procedures) have been affected by technology? Are there any immediate plans to use electronic formats for these procedures? Any long term planning happening?