

Understanding the potential: (or Recovering the lost potential.)

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Abstract: This presentation will unpack some data developed in the QSITE community and through a study with James Cook University which suggest that ICT services being delivered across school networks are not cognizant of curriculum and pedagogical rationales. The QSITE position on network development is that learning and teaching must be central to decision-making about the services hosted by our school networks. This needs to be balanced against the demands of developing manageable, reliable and secure networks, secondary agendas which according to QSITE research have so far dominated the design and management of schools' computing services. The data suggests that schools computing facilities are improving constantly but that the pedagogical agendas and curriculum designs which while developing and maturing are not demanding sufficient change in network design. Using data from two studies and the emerging QSITE Position paper, this presentation will put a case for ICT as a pedagogy, to be the primary influence on which services are hosted by the sophisticated networks and how teachers need more involvement in decision making.

Schools and ICT Potentials

Australian national and state education initiatives over the last 25 years repetitively stress the integration of computing technologies into compulsory education (AEC 1989; MCEETYA 2003; 2005; Tas 2002; Vic, 2001). Like Western governments worldwide, in Australia computing technologies are considered a motherhood solution to the needs of a highly skilled and technologically capable workforce. Implicated in this 'final solution' is compulsory school education, and its connection to future workplaces. The MCEETYA ICT Pedagogy Framework contends that ICT transforms processes of learning and teaching, making processes child centred, flexible, exploring and experimenting, focused on community engagement, highly collaborative and research-focused. They suggest current learning theories are shaping educational reform in classrooms: inquiry-based, mediated, constructivism, multiple intelligences, constructionism, connectivism, authentic problematisation, metacognition, and deconstruction and that ICT is both a pedagogical approach and a pedagogical aid.

MCEETYA also propose policy frameworks in learning architecture, (MCEETYA 2005b) as the application of ICTs to the processes that support learning, and learner-centric processes. They suggest that the tools in a learning architecture include networks services, desktop services, intranet services, interactive and online resources, interfaces and the physical configurations which support learning. Their model for learning architecture integrates decision-making at multiple layers, but each is focused on understanding ICTs as part of the core business layer of learning and teaching. They suggest that Learning Architecture needs to move focus away from "maintaining the security of information systems to developing a more holistic approach as the boundaries of applications blur and require holistic delivery" (MCEETYA 2005b:3), in school networks and in interconnections between school networks and systemic infrastructure.

There is a shift everywhere, in thinking about ICTs in learning to ICTs as an integrating pedagogical tool, with some corresponding discourse about the infrastructure which supports this. Systemically, there has been increasing energy focused on integrating systems, building metadata standards for harvesting resources and taking advantage of new bandwidth strategies. This discourse has not yet permeated the decision-making frames in ICT planning in schools: espoused views on computing technologies and student learning have shifted from an initial preoccupation with the teaching of computer skills, to focus more on issues of ICT access for all students (MCEETYA, 1999), the relevance of a 'whole school' approach to ICT teaching and learning (Curriculum Corporation 2003), and more recently to issues of school-based change management and teacher professional development (Henderson, 2004). If we listen closely to this shifting 'learnscape' we can discern a quiet mantra; in terms of ICTs in schooling, more is definitely better....

Cultural gaps

In undertaking a study of the ICTs Integration Instrument in Queensland schools, teachers were asked to judge the level and quality of ICT experiences children are offered. While doing so, teachers clearly indicated the ICT services available to them were bereft and that they felt disconnected from decision making about ICT services and management in their schools (Griffith University 2004). This added rationale to a joint research venture between QSITE and James Cook University to examine the quality of services to learners and identify the influences on decision-making.

Underpinning the study was an awareness of the differing perspectives usually held by network managers and teachers. Barone and Hagner (2000) describe the characteristics of 'the two cultures' hobbled with views that 'prevent much influence of one by the other'. They suggest the IT culture is attuned to the whole system and the whole organisation (a strength of their perspective), wanting to prevent dangers, striving for focus and consistency (at odds with other views) and wanting decisions that concentrate resources and effort (cognisant of their capacity to deliver). In contrast, faculty/teachers speak in idioms about how they work, the jobs they do and the culture they want to create around their work and the learning of their students. They are used to professional autonomy and not comfortable with outside agents influencing learning environments.

Barone and Hagner (ibid) suggest that each group has presumptions about change that fuel these divisions. Teachers have a liberal presumption that there is a need to invent and experiment for advancement of pedagogical ideas and this includes wanting to try new ideas with ICT tools. IT managers on the other hand, have a conservative presumption, where change is determined by deliberation and that services need to be proven before being implemented on a whole-scale basis. Barone and Hagner (ibid) suggest that leadership is necessary to resolve the cultural tension and that critical discussions need to 'make space' for a range of views in circumstances where not everyone agrees on what needs to be transformed, nor the strategies to drive such change.

The JCU-QSITE study addressed the consequences of this gap.

"This 'user' mindset is an expression of a broader administrative set of relations, encompassing service-level relationships based on identified client needs. The problem with being a client is that clients are 'done to' and 'done for'they are not expected to impose themselves on the technology, but are much more expected to have the technology imposed on them. Certainly, there will be more people using technology in our schools, but this use will be patterned rather than inspired, reactive rather than proactive, and reproductive rather than creative" (Baskin and Williams, 2005 p2)

In the school community, these differing tensions often reside in the one person. Most IT managers in schools are teachers too and amidst having inadequate time to undertake the role of network designer and manager, strive to establish conditions in schools which best fit everyone's needs. There is always debate about whether teachers should be network managers with opposing views on the costs of their labour. For some, the use of a teacher to maintain a network is seen as expensive compared to the costs of a technical support person (as if the jobs are interchangeable). In others, the costs of network managers are comparable to teachers' salaries and reflect the complexity of the task. Salaries arguments aside, debate continues about whether teachers can bridge the gap between the culture of IT management and the culture of the pedagogical and curriculum rationales which dominate teachers' perspectives.

In the JCU-QSITE study, the data collected from school-based ICT coordinators suggested that ICT coordinators had developed more of an IT management perspective, even though their practice in their classrooms was pedagogically sound. Further, the study suggested that the culture in the QSITE community had not matured to the point that it had yet hosted conversations about the impact of the ICT pedagogy movement on

the future demands for school networks designs. Here, we present the material effects of this pattern of ICT evolution in schools, focusing on five key questions affecting the potential of ICTs in schools.

1. What counts as ICT integration in schools?
2. Which factors influence ICT integration decisions?
3. Are all schools equally connected to ICT potentials?
4. Who determines ICT potentiality?
5. What kind of ICT potential are we building?

ICTS in Schools

This project features a convenient sample of regional secondary and primary schools. Like school clusters anywhere in Australia, a range of technologies exist across the cohort. These technologies enable activities in schools that are supported through online networks and databases: including record-keeping (and students' attendance, student achievement outcomes, finance and asset management); information provision (newsletters and daily bulletins); communications (email, discussion boards, Blogcasts and pod-casts); online content (accessible over the Internet); and library borrowing. In some schools, computers are linked to the Internet through telecommunications services including high-speed broadband, dial-up and through satellites; wireless technologies; personal digital assistants (PDAs) and handheld devices such as notebooks and laptops. Some schools in the sample are trialing interactive whiteboards, while others are reintroducing blackboards. Both synchronous (but mostly) asynchronous software is used to support online exchange between both learners and teachers. In all instances in this survey, the computing infrastructure and architecture provisions of participating schools include the hardware, software, intranet and Internet services, networking and connectivity requirements necessary for the teaching, learning and administration of schools.

Enquiry Method

A survey of regional schools was undertaken to better understand what ICT integration might look like at the school face. The survey instrument targeted eight key areas, namely:

- Network use, extent and health
- ICTs for Learning and teaching
- ICTs for School administration
- ICT School Management issues
- ICT Decision management issues
- Technical issues and standards
- Systems integration, and;
- Staff training and development

Type of School	Sample (18) %
Primary School	37.5
Secondary School	62.5

Table 1- Type of School

Taken together, this corpus of data comprised 1912 bytes of data for each participating school site, with a total of 18 schools participating in the project.

Affiliation of School	Sample (18) %
State High School (SHS)	43.75
State primary School (SPS)	31.25
Non-State High School (NSHS)	18.75
Non-Sate Primary School (NSPS)	6.25

To compare and contrast, in the first instance, any differences in patterns of ICT and Network use and behavior between the sub-groups, the survey responses were analyzed.

- by type of school (SHS, NSHS, SPS, NSPS);
- by school affiliation (PS and HS);

Table 2 – School Affiliation

Ranking Participating schools

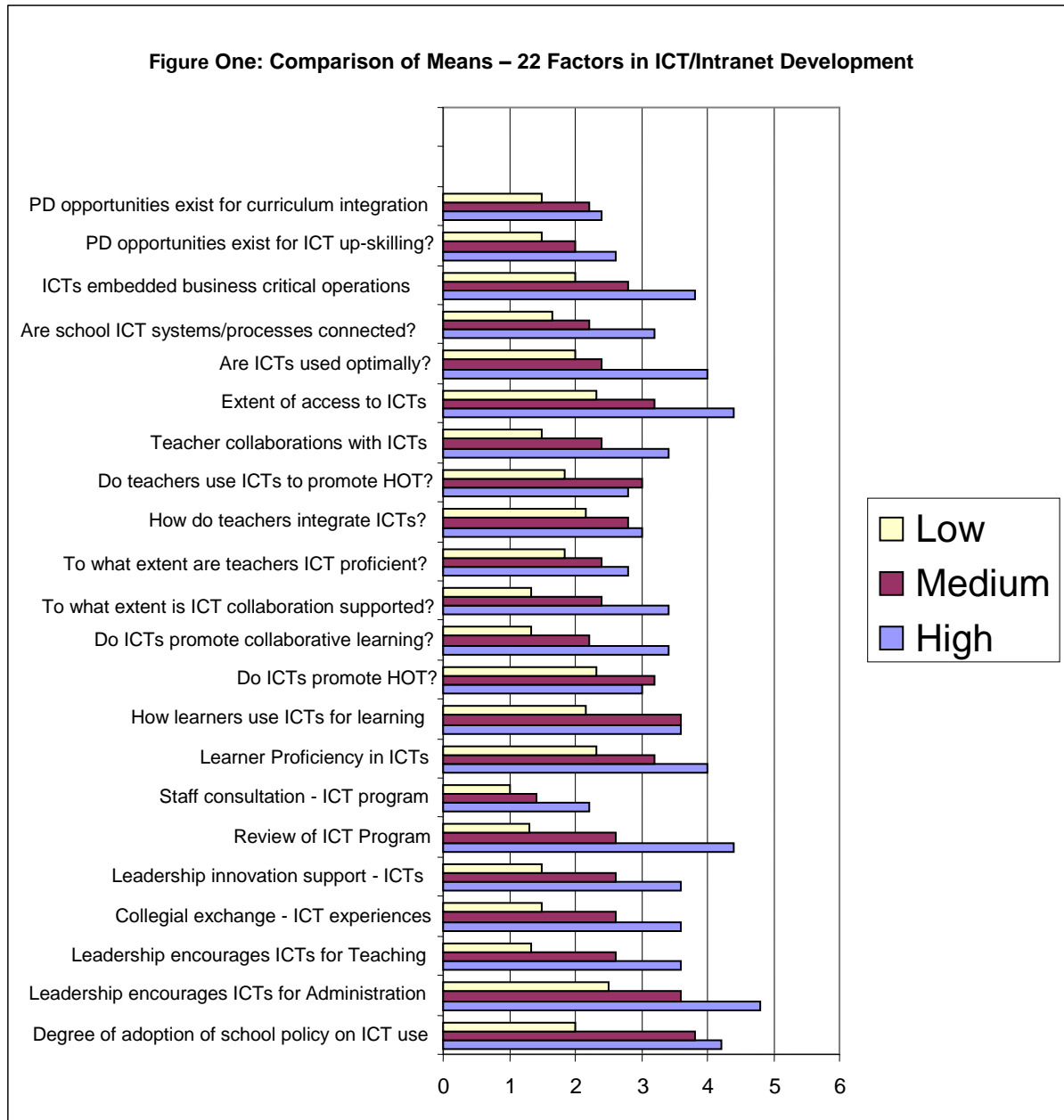
The survey data was used to identify and ‘rank’ participating schools in banded levels of ICT and Network performance. The basis for ranking was the relative level of integration of teaching, learning and administrative systems within the school, as reported in survey outcomes. School responses to the survey were used to derive an ‘integration score’ for each current school situation (see Ping et al, 2003). This was expressed as a percentage score, based on the sum of the individual components over the maximum possible score (appendix 1). Each component was scored from 1 (low level integration) to 5 (high level integration) over 22 items, and the individual values were summed to give a current score. There were 22 components in the survey (Table 3), giving a maximum score of 110. The percentage score was used to rank and band participating schools. Means and standard deviations were calculated for each school across the 22 components of the study. The resultant integration scores were then banded into three equal groups (low, medium and high) levels of integration based on current school situations.

	Low systems integration	Medium systems integration	High systems integration
ICT Integration Score 70- upwards			Swanfield SHS Ergonnan SHS Kwality SHS St Maddies NSHS South park SHS
ICT Integration Score 55 – 69		Canes SHS Anglophile NSHS Fudge Hill SPS Weary SPS Weary SHS	
ICT Integration Score 54 - below	St Throms NSPS Pitta Park PS Topity Bay SHS Blackrock PS St Molly’s NSHS Hoppleton SPS		

Table 3: School spread by integration scores

A one-way independent ANOVA was used to ascertain which if any of the 22 components (cited in figure 1 below) were significant in identifying low, medium and high integration schools. Table 4 identifies that 6 out of 22 factors are significant in

discriminating between schools as low, medium or high integration sites; these factors are extracted and summarised in Table 5 (below).



Collegial exchange about ICT knowledge and experiences has the strongest effect size (Table 5), and therefore the strongest effect on ICT integration level in participating schools. This is not however to suggest that teachers are necessarily engaged in a great deal of professional talk about the integration of ICTs in schools, curriculum and pedagogy; this factor, whilst incredibly positive, must also be viewed in the context of the school culture and setting. Collegial exchange about ICT knowledge and experiences usually transpires in the context of ICT planning and professional development. These planning and development sessions are largely the domain of the school administrators,

so the sharing and exchange that transpires within, usually relates to the 'sharing' of knowledge and experience about administrative views of ICTs a 'provider to client' model. Most collegiate exchange around ICTs in this study is initiated by the head of department - information technology, and enacted as school-based professional development. This trend is illuminated by other significant factors (Table 5).

factor	sig	factor	sig	factor	sig	factor	sig
School ICT policy	0.039*	ICT innovation	0.253	Learner use of ICT	0.253	Teacher integration ICTs	0.794
Leadership – ICTs in teaching	0.141	ICT program review	0.042*	ICTs & higher order thinking	0.380	Teaching-higher order thinking	0.229
Leadership – ICTs in Admin	0.047*	Staff ICT program involvement	0.095	ICTs & learner collaboration	0.222	Teacher ICT collaborations	0.240
Collegial sharing ICT experiences	0.018*	Pupil ICT proficiency	0.073	Teacher proficiency	0.083	Teacher/learner access to ICTs	0.080
Monitors ICT use/performance	0.035*	ICT systems connectivity	0.061	ICT systems embeddedness	0.049*	Staff skills dev/opportunities	0.092
Staff ICT integration skills	0.248			Variety-learner collaborations	0.222		

Table 4: Factor scores and significance levels * $p < 0.05$

Component	Significance	Effect Size
Extent of ICT policy adoption across schools	$F(2,15)=3.83, p<0.05, \omega =0.70$ <i>sig 0.039</i>	$r = 0.70$
Collegial exchange about ICT knowledge & experiences.	$F(2,15)=5.00, p<0.05, \omega =0.74$ <i>sig 0.018</i>	$r = 0.74$
Review of ICT policy	$F(2,15)=3.733, p<0.05, \omega =0.69$ <i>sig 0.042</i>	$r = 0.69$
Optimal use of ICT resources	$F(2,15)=3.987, p<0.05, \omega =0.71$ <i>sig 0.035</i>	$r = 0.71$
Leadership support ICT uptake for administration	$F(2,15)=3.43, p<0.05, \omega =0.640$ <i>sig 0.047</i>	$r = 0.64$
Embeddedness of ICTs in core business critical practices	$F(2,15)=3.83, p<0.05, \omega =0.68$ <i>sig 0.049</i>	$r = 0.68$

Table 5: Factor scores, significance measures and Effect Size

Trend analysis captures a centralized view of administrative systems, processes, planning and capacity that drives the school ICT vision, placing a heavy emphasis on policy adoption ($F(2,15)=3.83, p<0.05, \omega =0.70$); policy review ($F(2,15)=3.733, p<0.05, \omega =0.69$); leadership support for ICT administration ($F(2,15)=3.43, p<0.05, \omega =0.640$); and compliance through data driven core business critical functions ($F(2,15)=3.83, p<0.05, \omega =0.68$). A reverse trend analysis supports this contention, with non-significant scores assigned to teacher integration of ICTs into the curriculum (0.794) and staff ICT skills development (0.248) as contributing factors to ICT integration in schools. In fact, all teaching and learning

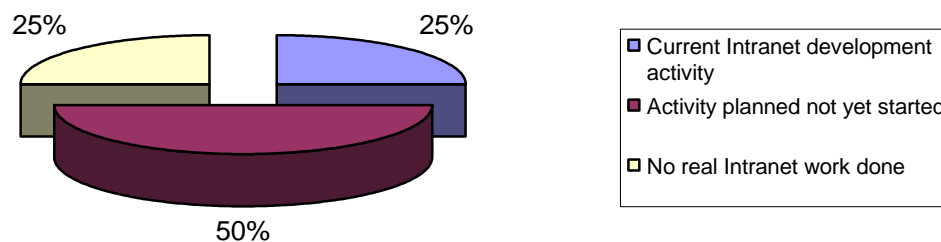
items (items 8 – 16 in table 4 above) are not significant to school integration scores (range 0.073 to 0.794), locating teaching and learning at the periphery of ICT development activity in these schools.

This trend is further exacerbated in data related to teacher and learner competence in ICTs as factors in school integration. Both teacher (0.083) and learner (0.073) competence are directionally strong results for schools; yet neither is significantly influential on school integration scores. The school focus on administration as the frame for critical ICT integration outcomes for schools is reflected in weak school leadership for teaching (0.141) and encouragement for innovation and experimentation with ICTs (0.253) scores. Staff adoption of ICT policy, ICT program review procedures, and the degree of leadership support for ICT lead administration has embedded ICTs in the critical business functions of each school. ICTs are part of the capacity management process of schools, and collegial exchange reflects a model of staff PD wherein most PD is run in-house by system and school administration teams to improve access for staff to existing ICT resources within the school. This ‘provider to client model’ defines the nature of school experience and knowledge about ICTs, and is also widely communicated and adhered to. Schools are busy building the pipe.

What kind of potential are schools building?

The survey found significant levels of activity in school intranet development across all participating schools. Over 75% of schools in the study were currently engaged in some kind of intranet development activity (see Figure 1 below), while 25% of all respondents reported no real work done or planned in this area (over the next 2 years at least). Of the active 75% of schools, 50% have work planned but are at the early stages of this cycle.

Figure 2: ICT & Intranet Development Activity in the Sample



Each school varied considerably in its vision of the pipe. The overarching aim of most intranet activity was to facilitate an effective administrative interface for the school community. In terms of a planning hierarchy, in ascending order **Low integration schools** expressed interest in developing

- Staff access to institutional information
- Staff access to course administration

Medium integration schools expressed an interest in developing:

- Access to subject description and learning outcomes
- Tracking students' attendance
- Fee payment
- Access to assessment results
- Student and staff portals
- Accessibility of resources for students with disabilities

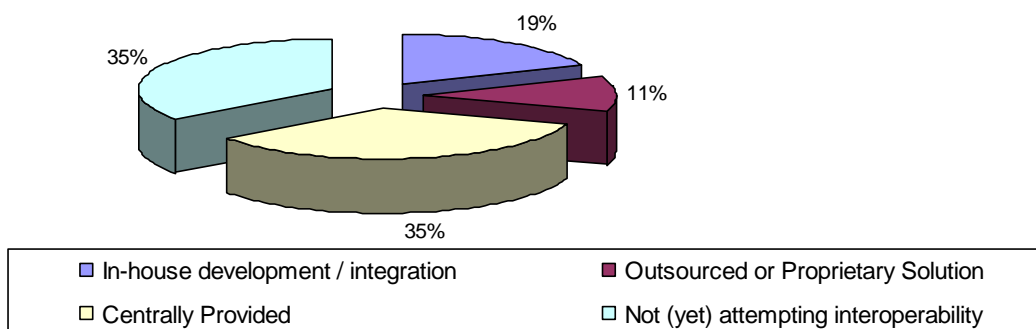
High integration schools expressed an interest in developing:

- Staff access to institutional information
- staff development
- A capacity for student enrolment
- Personalized access to electronic learning resources
- Student access to library / learning resource centre
- Student access to administrative data
- Monitoring students' use of online resources
- Support for users of electronic learning resources

Who is Building the Potential?

Figure 3 indicates the diversity of solutions adopted across the region, and also indicates the importance of customization and development to meet specific institutional circumstances. Some 48% of all participating schools have developed software in-house, and over 40% used proprietary or off the shelf software with local customization and development. With 35% of schools not yet attempting interoperability, centrally provided software and support forms the basis of most school software architecture and systems infrastructure. Of the 19% of schools engaged in in-house development of ICT and intranet activity, all are relying on current IT department staff to complete this work. In all cases, the development would most likely cease, if the staff member involved was to face a transfer or change of school. Of the 35% of schools not yet attempting interoperability, one of the major impediments to continued ICT and intranet development activity, was the 'messy' system currently in place. As one IT coordinator put it ... "it's like working with a house of cards ... move the wrong one, and it all comes down".

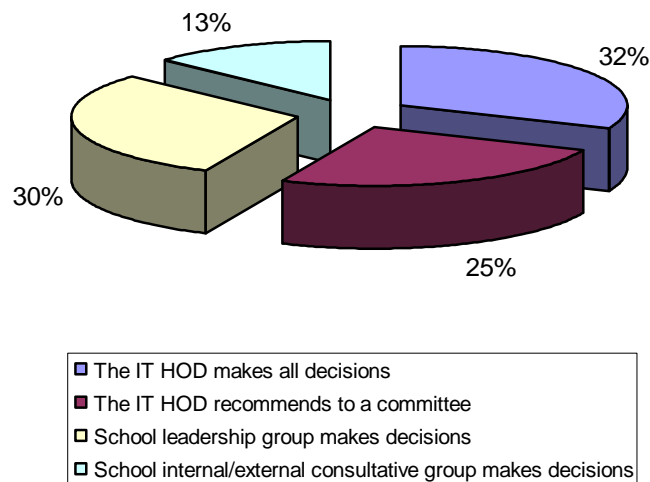
Figure 3: Operational models for ICT/Intranet development



Decision making, ICT & Intranet Potential in Schools

The key issue across participating schools is the need to embed development efforts firmly within a wider policy and strategic school context. As reflected in figure 3, the IT head of department (HOD) is a singularly influential character in the ICT decision-making tree in schools (32%). In 25% of cases, the IT HOD made formal recommendations to a working committee built around the ICT planning processes of the school. These recommendations were then matched against the ICT plan of the school, and actioned accordingly. In a further 30% of cases, the school leadership group made executive decisions about the ICT infrastructure and architecture of the school.

Figure 4: Decision-making trees for ICT/Intranet Developments in Schools



In all instances, the IT HOD formed part of the membership of the school leadership group. In 87% of cases, the IT HOD is directly involved in the planning and coordination of ICT and intranet development activities in schools. In 13% of cases, no member of staff was able to account for ICT decisions that had been taken (or not taken) in relation to existing processes and systems. In each of these cases, the initiative or innovation had been the product of a staff member who had 'passed on' to another school.

Constraints and barriers to ICT & Intranet development

There is considerable unanimity in the data to suggest that there are major constraints on and barriers to further ICT and Intranet developments in the host schools. Significant constraints or barriers are (ranked in order of importance across participating schools) include the lack of teacher knowledge about ICTs, the lack of teacher professional development in ICTs the teaching, and the lack of support staff to facilitate sustainable professional development.

Table 6: 'Considerable barriers' to ICT Development in schools

Barriers	Low Integration schools	Medium Integration Schools	High Integration Schools
Lack of time	88%	92%	56%
Lack of money	84%	72%	32%
Lack of incentives	72%	64%	56%
Lack of teaching staff knowledge	84%	80%	80%
Lack of teaching staff development	76%	88%	80%
Lack of support staff	88%	60%	72%
Current organizational structure	64%	40%	32%
Technical problems	64%	40%	28%
Too many/diffuse/diverse standards and guidelines	32%	36%	32%
Too few standards and guidelines	32%	36%	28%

Not surprisingly, the human factor is perceived as the most critical in nurturing the ICT culture and growing the critical mass of teachers (Rogers, 1995) able to sustain the use ICTs effectively in their teaching. In low integration schools, this is compounded by low capacity perceptions (reflected in high money, time, support, technical problems and lack of incentive ratings). In all schools however there is an acknowledgement that teaching staff represent the greatest challenge to school renewal and ongoing ICT integration. The lack of perceived incentive to self-develop is strong across all schools, but compelling in low integration schools. Out of the 18 schools in this sample, only 4 (25%) utilize the learning place as a site for possible support and ideas. These comprise 3 medium integration schools - 1 SHS, 1 SPS (both new basics) and 1 NSHS. Only 1 low integration school (a NSPS) admits to accessing the Learning Place via linked intranet but cautions their staff, that these vignettes are not to be used as 'entertainment' but as 'learning episodes'.

In high and medium integration schools the current organizational structure is perceived as supportive of ongoing ICT staff and systems integration. In low integration schools the current organizational structure (read school-based management team) are perceived to perpetuate ongoing ICT problems; with this perception comes the reality of increased technical problems. The corollary of this is that schools who are struggling to implement and integrate ICTs, face the additional burden of increased professional development costs (time and support capacity). The glaring lack of support staff reaches crisis point, as schools descend down the ICT integration scale, from high, to medium to low integration school. The lack of support staff at the low integration level, further compounds with problems related to capacity – i.e. resources, money, support, expertise, and incentive resulting in an ever decreasing circle of opportunity.

High integration schools perceived more incentives to proceed with further ICT and Intranet developments, and believe they have the money and comparative resources to do it; for example, two of these schools had engaged in external partnerships/consultations. Organizational structures in these schools are not

considered to be a liability in the same way as in low integration schools, despite the realization among many high end schools that ICT development requires a very fundamental rethink of institutional business processes and procedures. Technical constraints and standards issues came a lot lower in the scale of importance right across the board, and this has implications for interoperability across the region. The robustness of IT infrastructure and systems also emerges as a real concern as system components are integrated. Many schools still run dual Mac and PC networks, and lack the time, resources and expertise to address risks to system and data security.

All medium and low integration schools reported turnover of key ICT staff and systems in the last 3 years. While the integration scores differentiate between schools and school ICT and intranet development needs, a basic typology exists here (See Rogers 1995; Hagner and Schneebeck, 2000). Low integration schools report higher relative time, money, human capital, knowledge, and incentive and skills barriers than do medium and high integration schools. The scale of the integration task is clearly daunting to many schools. There is a growing awareness of how large training and professional development needs are, not only in relation to pedagogy, curriculum change, IT skills and awareness, but also in relation to wider 'cultural change' issues as school systems develop and roll out new systems and processes over time. At the heart of these findings is an emerging digital divide: of the low integration schools, four have an indigenous population greater than 1/3 of the student group, one is an all-girl Catholic secondary college, and the remaining school is a Catholic primary school.

A Potential Beyond Microsoft

In seeking to ascertain if schools had developed ICT-managed learning environments - virtual learning environments, e-learning systems and intranets - the study revealed that knowledge about the capacity of such services was lower than expected in all categories of schools. In low integration schools, very little was understood about the potential of intranets for example. In medium and high integration schools much more was known but there was very little evidence of any development of such services. Where services had been installed they were used mainly by the ICT coordinators and fellow peers, but were not holistically taken up across any schools. This complements a poll of 283 people undertaken in QSITE-community where most responded that their schools services were not sufficient to met new ICT pedagogical demands.

The study uncovered the factors impacting on the quality of ICT services in schools. Longevity of the ICT coordinator or ICT learning leader was the single most influential factor in the level and sophistication of school services available to learners. All high integration schools had a long term leader and all low integration schools did not have a long term leader. Who made the decisions about network services, was also a strong influential factor. In high integration schools there was diversity in decision making with strong ICT committees surfacing a variety of perspectives complemented by outside consultation. Schools with a single decision maker were often in the low integration category and a few in the medium integration category, with considerable evidence that single decision makers did not enjoy the support of the staff in the school for decisions which favored technical perspectives rather than curriculum and pedagogical perspectives.

In this study it was important to pin down precisely what is was that networks delivered. The use of ICT in schools benchmarked by groups like the OECD, provided a core

understanding of levels of ICT use in schools expected by the community. It was expected that the study would reveal that Queensland networks delivered services which ensured all students had opportunity to address the OECD Basics.

- Operating a computer - effective file management and digital competence in an IT environment.
- Writing documents
- Using spreadsheets and information searches
- Graphic illustration
- Program writing
- Email use

In the study, a very broad software audit of the standard desktops was conducted to see if networks delivered any other services beyond the Microsoft suite.

Desktop software beyond the Microsoft Suite	None	1 piece	Some pieces	Many pieces
General curriculum software	8	5	3	1
Graphics manipulation software	10	3	3	2
Video manipulation software	13	3	1	1
File management system, not only directory trees	18			
Music	12	2		
Cad/Accounting	All secondary schools			

Table 7: 'Desk-top Potentials in schools

This clearly suggested that the majority of the schools in the study could not deliver services to enable even the most basic OECD ICT literacy level. Further, the schools' support for data management and core ICT literacy was not promising.

Schools offering reasonable space for students work	School providing the facility for users to move data between school and home	Users allowed to keep information from year to year
Under 10 mb 7	Not supported 11	Not allowed 13
10 mb 4	Users allowed and supported 3	Staff allowed 2
20-30 mb 2	Not addressed 3	Students data kept 2
Unlimited 5		

Table 8: 'Data-management'

For the delivery of online services to support learning, the data revealed the following pattern.

Service	Not available for students	Available
E Learning environments	17	1
Email	10	7
Intranet spaces	7	2
Intranet services	14	1

Table 9: 'E-learning Achitecture in schools

It was generally clear that school' networks are becoming increasingly robust and reliable and that the access to networked machines was high in all schools. However the quality of services delivered across them did not match the expectations of the pedagogy and curriculum policy frameworks being held up as excellent practice, nor was it in keeping with the stories of excellence often shared by the leaders in the QSITE community. ICTs as a pedagogical approach are not mainstreamed in our schools and perhaps this goal is unattainable until we design networks with learners and teachers in mind.

Recovering ICT Potential....

National and state education initiatives over the last 25 years have delivered an integration (of sorts) of computing technologies into compulsory education. Evidence from this study shows that there is a great deal of ICT integration and intranet development activity taking place in schools at all levels. Learning in an online world (MCEETYA, 2000) has delivered the protocols for an ICT rollout strategy that has enabled schools to build capacity in Online Content (2004); Learning Architecture (2003); Research Strategy (2003); and Bandwidth (2003). There exists in schools an overall sense that ICT and Intranet development is a 'good thing'. It is broadly accepted that ICTs will at some stage of evolution provide accessible/flexible learning experiences, increased administrative efficiency, integration of functions and improved processes across the school, despite the fact that few schools in this study have tangible experience of these advantages. There is also an emerging consensus that ICTs are the way forward and will provide long-term advantages, such as improving reporting processes, compliance procedures, managing data costs, widening access, etc. At the same time, however, there is a sense of impending panic here in the 'smart classroom' that, because everyone else is going down this road, schools must follow or be left behind.

This study raises the need for a new focus on pedagogy and leadership in teaching for ICTs. The data emerging from this project confirms a silence in relation to leadership in ICT teaching; What is not apparent in participating schools is any real sense that ICTs are as yet fully embedded as interoperable and integrated strategic and operational frameworks (the e-learning environments utilized by schools in this study are restricted to experiments by HODs of the IT department). All schools have an ICT development planning process, but for many this is a transparent box-ticking exercise that delivers few consumables other than central office compliance. Only in high integration schools are ICT activities included in a variety of strategic planning documents, but it is hard to identify any examples where ICTs are yet an integral part of the curriculum philosophy, policies and practice of the school. We have been slow indeed to recognize the impact of ICTs as a learning tool, and as Siemens (2004, p 6) confers, even slower "to recognize the environmental changes in what it means to learn". In *Telling Tales out of School: Why ICT is Problematic*, Mark Brown of Massey University (NZ) points to ICT integration as multifactorial, including:

- Curriculum integration - how do ICTs relate to curriculum goals and content?
- Spatial integration - are ICTs generally embedded in learning activities?
- Temporal integration - does ICT activity connect to established learning activities?

- Pedagogical integration – do ICT choices and use constructively align with teaching approaches? and:
- Attitudinal integration - to what extent are ICTs considered problematic by teachers and students alike?

In a personal communiqué (July, 2005), Mark concludes “*Of course, there is still an implicit assumption embedded within these categories that integration is the ultimate goal and they offer no explicit recognition of the need for teachers to go beyond what is currently possible by reconceptualizing the curriculum itself*”. Thus it can be said, that the management and marshalling of resources to achieve desired school-based ICT outcomes is a significant challenge facing schools. Realizing that complete knowledge cannot exist in the mind of one person requires a different approach to creating an overview of the situation. Much ICT decision-making in schools has been referred to the IT HOD in consultation with (or to) the school management team. Diverse teams of varying viewpoints are a critical structure for completely exploring ICT integration ideas, and to date, these teams do not yet exist in schools.

As a postscript, two of the schools in this study have already embarked on the partnering journey with external stakeholders; thus it can be said that innovation is also an additional challenge facing schools. This opens the way for professional societies and associations to take on critical developmental roles in the formulation and lobby for future direction. Each school’s ability to foster, nurture and synthesize the impact of various views of information is also critical to its survival. Low ICT integration schools in this study are already pointing to the existence of an emerging digital divide, one in which some schools will lack the infrastructure and architecture to move to a whole school approach to ICT teaching and learning, and in real terms, face the prospect of being left behind.

References

Australian Education Council (AEC) (1989). *Australia's Common and Agreed Goals for Schooling in the Twenty-first Century: The 1989 Common and Agreed Goals for Schooling in Australia* (The 'Hobart Declaration') <http://www.mceetya.edu.au/hobdec.htm> [accessed July 24th, 2005]

Barone, Carol A, Hagner, Paul R (eds). (2000) *Technology Enhanced teaching and learning*. A Price WaterHouse Coopers.

Baskin, C. and Williams, M. (In Press 2006). ICT Integration in schools: Where are we now and what comes next. *Australian Journal of Educational Technology*.

Brown, M. (2004) *Telling Tales out of School: Why ICT is Problematic*. Invitational Address CODenz. Auckland College of Education. 25th March.

Brown, M (2005) *Personal Communiqué*. July, 2005.

Curriculum Corporation for the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) (2003). *Learning in an online world: Learning Architecture Framework*. Curriculum Corporation, Melbourne Australia

Curriculum Corporation for the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) (In Press). *Learning in an online world Leadership and professional learning strategy*

Department of Education, Training & Youth Affairs. (DEETYA) (2000) *Learning for the knowledge society. An education and training action plan for the information economy*. <http://www.detya.gov.au/schools/publications/reports/learning/learning.htm> [accessed April 12th, 2001].

Department of Communication, Information Technology and the Arts, Australia's Strategic Framework for the Information Economy 2004 - 2006: *Opportunities and Challenges for the Information Age*. <http://www.dcita.gov.au/ie/framework> [accessed June 9th, 2004]

Department of Education (Tasmania) (2002). *ICT in education strategic policy 2002-2005*, <http://connections.education.tas.gov.au/attachments/00000001/ICT%20in%20Schools%20final.doc> [accessed July 24th, 2005]

Department of Education, Science and Training (DEST (2005). *School education summary* http://www.dest.gov.au/sectors/school_education/School_education_summary2.htm [accessed Sept 12th, 2005]

Hagner, P. & Schneebeck, C. (2000) Engaging the Faculty. In Barone, C & Hagner, P. (Eds) *Technology-enhanced Teaching and Learning: Leading and Supporting the Transformation on Your Campus*. Educause Publication.

Henderson, M. (2004). Investigating how a virtual Learning Environment can sustain the professional development of teachers: promoting effective teaching with ICT. *PhD Confirmation Seminar*. Townsville, November 2004.

JISC (2003) (Joint Information Systems Committee) "*Strategic Activities: Managed Learning Environments*". at <http://www.jisc.ac.uk>. [Accessed 24th, July, 2003]

Ping, L.C; Swe, K.M; Hew, T; Wong, P; Shanti, D; and Lim, B. (2003) exploring critical aspects of information technologies integration in Singapore schools. *Australian Journal of educational technology*. Vol 19. Number one. Autumn 2003. pps 1 – 24.

Ministerial Council for Education, Employment, Training and Youth Affairs (MCEETYA), (2005). *Joint Statement on Education and Training in the Information Economy*. <http://www.dest.gov.au/ministers/images/js.pdf> [accessed July 24th, 2005]

Rogers, E. (1995) *Diffusion of Innovations*. 4th Edition. New York. The Free Press.

Siemens, G. (2004) *Connectivism: A learning theory for the digital age*. Elearnspace. Downloaded from [HTTP://www.elearnspace.org](http://www.elearnspace.org) on October 17, 2005.

State of Victoria (Department of Education, Employment & Training). (2001). *Information and communication strategy 2000-2004*. Melbourne: State of Victoria.