BYOD in Education

A report for Australia and New Zealand

Nine Conversations for Successful BYOD Decision Making
Joseph Sweeney • IBRS • November 2012

Prepared on behalf of

Dell
Microsoft

The power to do more

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Methodology

This report details the observations and findings from in-depth interviews and executive roundtable focus groups conducted by IBRS between August and September 2012. A total of seven “BYOD in Education Executive Roundtables” were conducted via IBRS’s standard roundtable methodology, which is based upon a grounded qualitative research model (Lichtman, 2012), whereby:

- An invitation was presented to executive-level peers involved in education to participate in a “BYOD in Education Roundtable,’ where a free exchange of knowledge, experiences, challenges and solutions would take place, and where the peers could learn from each other.

- A broad cross-section of peers involved in education (both technical staff and educators) from across the education spectrum (K12, Vocational and Higher Education) were represented at each roundtable.

- The majority of participants were interviewed by telephone prior to the roundtable in order to capture:
  - issues the participants wished to discuss,
  - the participants challenges around the key topic of device and software deployment in education,
  - and any narratives or examples they could bring into the roundtable discussion that may be of interest to their peers.

- The results of the phone interviews were used to structure the flow of roundtable discussions, ensuring that the roundtables represented grounded research and that the issues identified by the participants would be directly addressed during each session.

- All interviews and roundtables were conducted under the Chatham House Rule: that is, all comments and discussions were conducted under a code of strict anonymity, but all information gathered could be shared.

- Roundtables were held in 7 cities: Adelaide, Auckland, Brisbane, Cairns, Melbourne, Perth and Sydney.
- Each roundtable lasted from 12:00 until 2:30, with a short break for lunch and private peer discussions.
- A total of 74 participants attended the roundtables.

Finally, information from public sources, online surveys and from IBRS’s existing research into Australian education was taken into account. This study was funded by Dell.

About IBRS

Founded in 2002 Intelligent Business Research Services Pty Ltd (IBRS) has grown into the largest Australian owned IT Advisory services company.

With a unique focus on Australian and New Zealand issues, combined with the experience and background of our seasoned analysts, IBRS provides unmatched insights to what is, and what should be, relevant to local CIOs and senior IT executives.

IBRS offers clients retained advice through our client intimate engagement model. Clients may directly contact our analysts to get our research put into the context of their specific circumstances.

Our analysts are all recognised experts in their fields and are regularly quoted in the press and are sought after speakers and event facilitators. Most importantly, our analysts are locally based, so we understand our clients’ issues and often respond to requests for advice on the same day.

Our research is designed to give our clients actionable advice which is derived from many client interactions and peer networking. IBRS’s clients include many of the largest Australian companies and state and federal government departments.

Services include:
- regular research reports
- extensive research database
- assistance with document reviews
- strategic planning
- market scans
- highly tailored advice
- consulting
BYOD’s Origins

BYOD is an acronym for “Bring Your Own Device.” First used by the private sector, BYOD is most commonly associated with initiatives by commercial entities to have staff procure laptops and notebook computers, and use these on the corporate network for work activities. The company would provide a one-off lump sum payment to staff for the procurement of the devices, possibly under a salary sacrifice scheme in much the same way as vehicles are sometimes provided to staff. Initially, the idea of BYOD was to ‘push out’ the costs associated with end-user computing device to staff, while also providing staff with a greater degree of freedom to purchase a single device of their choosing that would offer both personal and business use.

In the private sector, the reality is that BYOD of laptops and notebooks is more smoke than fire. Examples of large-scale BYOD of laptops and notebooks are rare and the expected savings questionable (McIsaac, 2012). That said, the few examples of BYOD laptops programs have been widely reported (Messmer, 2012), and in these cases it is clear that a key success factor in the uptake of BYOD was organisational change, not cost savings (Anon, 2012).

In recent years, BYOD has taken on a new aspect: that of mobile devices, particularly driven by the popularity of tablets and SmartPhones. This type of BYOD is much more common (McIsaac, 2012). In most cases, staff will have purchased these mobile devices completely independently of the organisation, and the organisation allowed limited connectivity to corporate assets via the corporate network: generally email, calendaring, and Internet access.

Educational BYOD

In the last four decades, educational systems have frequently attempted to adopt trends in business to the educational process. The BYOD trend is no exception. During pre-roundtable interviews, almost all respondents stated that that BYOD was a significant trend in education.

However, defining BYOD in education has proven to be difficult and a source of much debate during the roundtables, with participants arguing that BYOD as:

- the ability for a student to take home a school-procured laptop,
- co-ownership models, where students’ parents pay a contribution towards a laptop,
- students procuring their own laptop and bringing into the class,
- students being able to bring any personally owned device(s) into the classroom, which support a second, standardised device either provided by, or dictated by the school,
- students being free to run a standard “virtualized desktop” on a laptop or device which they procure and own.

While the definitions of BYOD varied widely, a common structure ran through all: a distinction (and tension) between who controlled the device versus who funded the device.

... it became evident that the more significant issue was not the “device” per se, but the delivery of software and services that impact educational activities.

As the roundtable discussions delved into the nuances of educational BYOD, it became evident that the more significant issue was not the “device” per se, but the delivery of software and services that impact educational activities. The traditional corporate definition of BYOD was quickly superseded by discussions about how student and teacher owned consumer technology was impacting every aspect of educational ICT: technology strategy and procurement, pedagogy, assessment, professional development, policy and even nature of teaching itself.
What is Driving BYOD in Education?

During pre-roundtable interviews, the majority of respondents stated that BYOD was an important concern, but like commercial enterprises, there were few actual examples of BYOD implementation.

In Australia, BYOD interest has peaked sharply in 2012 as the sustainability of the National Secondary School Computer Fund and Digital Education Revolution funding programs come into question. Educators and educational technologists alike are concerned (Danks, 2012) with school’s ability to continue providing computing devices to students should, as it seems likely (Foo, 2010b), funding models for one-to-one student programs be withdrawn in 2013-2014.

In this context, the attraction of BYOD in education is both as obvious as it is superficial. Many educators see BYOD as a way to reduce costs, effectively pushing out the cost of procuring student devices to parents. There is belief among many that BYOD will reduce the ICT budget, and enable schools to continue, or even expand, one-to-one student device programs. Unfortunately, this view does not take into account the potential new costs associated with supporting BYOD. Depending upon the approach taken (which we will explore more fully in Defining New Models for ICT Deployment in Education) BYOD implementations can be more expensive than school-procured devices.

In addition, over the last year there has been a dramatic rise in the prevalence of students bringing personal computing devices (tablets, smartphones and laptops with greater or more personalised capabilities than those issued by the schools) into the classroom. Like the commercial sector, education – especially higher education – has been quick to provide connectivity and basic services to these devices. In addition, there is a great deal of interest in utilising these consumer devices – especially tablets devices – into classroom activities. Several schools in this study have already done so.

Impact of the DER, BER and NSSCF

In Australia, the Digital Education Revolution, Building Education Revolution and National Secondary School Computer Fund (NSSCF) programs have dramatically changed the technology environment within education. These changes have created a unique, some argue artificial and unsustainable, environment with regards to deployment of student and teacher devices in Australia.
Combined, these programs reset public expectations with regards to the use of ICT in education. The media (Foo, 2010a) and public relations activities surrounding the programs justified the spend through claims that student laptops improved student outcomes (Bebell, Dorris, & Muir, 2012; Trotter, 2007). Arguing the validity of such claims is outside of the scope of this report, but the public now widely perceives that ICT is an important aspect of educational practice.

Given public expectations for student devices, and the uncertainty and unsustainability of funding for one-to-one student laptop programs (Sweeney & McIsaac, 2012), educational institutions have a high level of interest in BYOD, but mostly focused around externalising costs to the institution.

In addition, the massive deployment of student devices throughout all secondary schools changed the competitive landscape between private and public schools. Prior to the NSSCF, some of Australia’s elite private schools actively differentiated themselves from public schools through student laptop programs. As public schools adopted one-to-one laptop programs, this point of differentiation was removed. The result has been that many of the elite schools further differentiated themselves by “using devices that were more attractive than those used by state schools”. Put succinctly, Apple’s products and, more recently have become the devices of choice for elite schools.

Another method of differentiation has been to deploy tablets (almost exclusively iPads) to younger students. These methods of differentiation have created something of a vendor-bias in Australian education, and this in turn skews the discussion of BYOD. This is likely to be a short-term issue, with the advent of Windows 8 tablets and Android devices bringing more changes to the market.

Both the strong focus on cost externalisation and stratified device selection for differentiation are not unique to Australia, but the DER, BER and NSSCF have exaggerated these two issues. This was clearly identified when comparing the discussions held with New Zealand participants, to those in Australia.

In Australia, the BYOD discussions often start from a perspective of how to manage and support devices, while in New Zealand (which lacks the influence of the DER, BER and NSSCF programs), discussions were more on how pedagogy would be reshaped by consumerisation and student expectations.

Education is not the same as business: we are not about making or saving money. In education, if you are doing BYOD to save money, you are missing the whole point.”
The Big Questions

In order to understand the most significant issues facing education with regards to the topic, all participants were asked to define the single most important question regarding BYOD: “If you could have just one question answered during the roundtable discussion, what would that question be?”.

The responses were used to inform the roundtable discussion. It should be noted that many of the respondents proposed more than one question. The questions ranked by prominence, where:

- **REFERENCE**: What are other schools doing with regards to BYOD? What have schools done well and where have they failed with BYOD?
- **FUNDING**: How will the next generation of student and teacher devices be funded in 3-5 years time? Will the NSSCF be continued?
- **JUSTIFICATION**: What are the benefits of BYOD? Is what we are currently doing right? Are we on the right path? What is the educational outcome we think we are chasing with BYOD?
- **FUTURE ARCHITECTURE**: How can I make BYOD work at our school? Where will we be with regards to BYOD and device deployment in three to five years’ time? How do you use Virtual Desktop Infrastructure (VDI)? How do you intend to deliver a secure & stable platform in an unstable environment?
- **PROFESSIONAL DEVELOPMENT**: How do you get teachers to change their practices to utilise student-owned devices?
- **DUTY OF CARE**: What is the responsibility of educational institutions with regards to monitoring and protecting student and learning environment?
- **SKILL REQUIREMENTS**: What range of skills and technical capabilities will we need to support students’ and teachers’ devices?

Consolidated Narrative

Following is a consolidation of conversations that took place during the seven roundtables. We have woven this into a conversational narrative that reflects the key points of discussion, using the participants’ actual and paraphrased comments.

**Defining BYOD**

There is a spectrum of BYOD. It ranges from the school dictating what device a student should bring to school, and having the school manage the device, to having students bring in any device and simply connecting to the school network. The question is therefore, how does the school guarantee that the device a student brings in is suitable and appropriate for learning tasks.

BYOD is a choice by the business to go down a particular path “to change how we offer resources”. The real issue with BYOD is that mandates change from management to service delivery.

We already have a fully managed notebook for students, so for us the issue is really “bring your own other device” or BYOOD. In addition to their mandated machine, students also have personal iPads, SmartPhones, etc. We provide base line functionality for education on our laptops which support our curriculum, and let allow these other personal devices to connect to the Internet to assist, but not dominate, the learning process. We are finding that students use these other devices for information searches, consumption, self-management (diary) and alerting, and they switch back to the school-provided device for more involved work.
I think BYOD is a misleading term. In education, it is really about “bring your own stuff,” which has students not only bringing in their own devices, but also their own software. In this sense, BYOD is centred on the modern workforce, and providing education to the modern Gen Y/Z who work with the latest consumer gadgets.

BYOD is inevitable. We are going to face a tsunami of devices coming into the school. Students have an expectation that they can have a device to access the information they need. So educational organisations need the infrastructure to allow this to happen... which requires some level of funding.

BYOD really forces pedagogical issues to the fore... because if you cannot standardise the learning environment, you have to move beyond simple textbook substitution.

Be careful about the above idea, because it assumes a lot about the students. There is an impression that students do not need to be taught about technology; that all children are created equal with regards to technology; that they can all make sensible choices about what is the best tool to use at any given time. Clearly, this is not the case.

Likewise, it assumes all teachers can cope with the change and variability of technology in a BYOD environment. In reality, there is a broad spectrum of teachers with and without skills... from talking with other ICT staff, this is the same in all the schools, but most schools will not talk about it. BYOD changes the entire teaching model from one where teachers control what students deliver (eg. “use PowerPoint to do X”) to one where the student controls their own delivery (eg. the teacher says “demonstrate your knowledge of X”.) Very few teachers or students are well versed in that type of education.

That is a professional development issue – not a pedagogical issue. We need to be focused on what sort of teacher is best for students now. The world has changed. Students have changed. The teachers had damn well change too.

BYOD changes the entire teaching model from one where teachers control what students deliver to one where the student controls their own delivery. Very few teachers or students are well versed in that type of education.
What we need to focus on is flexibility for ‘personal learning’. Of course, we need to balance that with the current systemic, centralised teaching model. But we know from research that the more personalised the teaching, the better the outcomes.

At the end of day, teachers are users. They should not have to fit the curriculum into BYOD. BYOD is just a tool. The curriculum is what the user is interested in, and the question should be how BYOD fits the teaching environment, not the other way around.

Professional Development

Currently, everyone is focused on providing a device for as many students as possible, but that rush to supply devices is actually our stumbling block. Rather than discussing devices, we need to put more time and resources into enhancing teacher skills through professional development. There is no point of mass delivery of technology into the class without getting teachers support they need. In fact, I’d argue that it is not only ineffectual, but counterproductive.

I think it is more than just giving teachers more technology training. We need to have teachers change their pedagogy and the attitudes to classroom management. In the new world of learning, where students have their own devices, students will want to make decisions on how they synthesise information from any sources using any sort of software and device. So teachers can no longer tell a student how to do a task, just what outcome is desired. For many teachers, this means “losing control” of the lessons. The role of teachers changes from being the font of knowledge and dictating how things are to be done, to being a guide. So supporting BYOD is not just a matter of skill, it is a fundamental shift in how teachers teach.

That sounds great, but I am not convinced that teachers are ready for the shift to full BYOD.

I think that this is more a matter of leadership. The key success factor in our one-to-one notebook program was our teacher’s openness to new ways of teaching. We provided a lot of support for them: we ran workshops, we still have regular weekly ICT afternoon, etc. It was also important to go slow to allow teachers to witness the benefits for themselves. We started with a single class, got that working well with ICT… Now we have eight classrooms working this way. Positive peer pressure among the teaching staff is important. Teachers will change if they see the successes of other teachers.

This is an interesting problem for us. We are a very successful school with regards to academic outcomes. As a result, teachers ask, “If we are being successful, why change? What is the point of new technology in education if we are already performing well?”

Furthermore, because we are a desirable school, we only get allocated ‘experienced teachers’ that have a lot of history with the department. We do not get young, tech savvy, teachers. So the question of using something as radical as BYOD in the classroom just does not fit into these teachers’ way of thinking. These teachers do not understand that the student in front of them is a very different student from twenty years ago.

Is it true that younger teachers are more tech savvy? There seems to be this assumption that older teachers avoid ICT and younger teachers naturally embrace it. I don’t see that at all.

That is a good point. We certainly do not see that the fresh post-grad teachers are any more creative in their use of technology than those of ten years ago.

The reason is that these new teachers are being taught by teachers in the Universities that are still operating on a 30-year old teaching model. The universities are simply not producing teachers that have the ability to let go of the power and control in the classroom and allow students to fully embrace the technology that surrounds them for educational purposes.

All of this talk about teachers letting go of control is a bit dangerous, in my opinion. I also reject this notion that the teacher simply becomes a guide in class. For younger students especially, teachers should not let go of the learning space: these students are still learning how to navigate their world, and teachers need more control over the device and use of the device, otherwise, we will get a series of behavioural and classroom management issues.
Technical Implementation

Device Management
We are struggling with how we should manage BYOD. What are others doing? What is the infrastructure for going to BYOD?

We use the traditional approach to laptop management. We have a Standard Operating Environment (SOE) which is centrally managed via Microsoft System Center Configuration Manager (SCCM), and use Group Policy to fully manage the laptops. Students do not have administration rights on the device. This dramatically improved reliability for the devices, and also the total cost of ownership is far lower... so low in fact, that we have been able to reduce costs for parents over time.

From a technical perspective, there are many approaches to implementing BYOD, ranging from using a standardised device and centralised management tools such as SCCM, to the use of centralised Virtual Desktop Infrastructure (VDI), Application Virtualization, web-based application delivery, AppStore, local Virtual Machines images on BYOD computers, and now Windows to Go. From a technical team's perspective, there are too many options to consider and we really do not understand the total cost of ownership (TCO) for all of different scenarios. While we understand the TCO for fully owned and centrally managed laptops, we are completely in the dark about the TCO for things like VDI.

I know two schools that have implemented BYOD via VDI already. Every student has their own laptop, and all applications are delivered to the students laptops and home computers via VDI. One of these implementations works well, the other not so well.

We introduced VDI in our school. One of the most important things was the design of the storage. We use solid state flash drives and used 'cloned' images (rather than persistent) for students and teachers. The flash storage ensured a responsive experience for the users, and the use of clone desktop images dramatically lowered the costs.

The secret to successful BYOD is to do it incrementally: start small, prove the technology works in practice, then move to more full-featured BYOD. We have deployed a limited amount of BYOD using Citrix. In reality, this is not true BYOD, but a transition from Windows laptop one-to-one devices, to enabling a rich Windows environment on iPads. In a few years' time, we will migrate this all to true BYOD.

What is the biggest concern in implementing virtual desktops to student devices?

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<th>Concern</th>
<th>Percentage</th>
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<tr>
<td>Storage and infrastructure costs</td>
<td>26 (13%)</td>
</tr>
<tr>
<td>Licensing costs</td>
<td>49 (25%)</td>
</tr>
<tr>
<td>Application and data security</td>
<td>64 (32%)</td>
</tr>
<tr>
<td>Bring Your Own Device policy</td>
<td>38 (19%)</td>
</tr>
<tr>
<td>Other</td>
<td>22 (11%)</td>
</tr>
</tbody>
</table>

Answer | Age | Seniority | Gender
-------|-----|-----------|-------
Overall demographics | 15 | 16 | 6 | 3 | 18 | 15 | 13 | 11 | 9 | 7 | 5 | 3 |
| 18-29 | 30-36 | 37-44 | 45+ |
| Manager | 45 male | 10 female |

Prepared by Joseph Sweeney, IBRS
Networking

Reliable networking is a major concern for us. The number of computers have grown with the one-to-one notebook program, so too have the number of Internet connections.

We are now finding that students are connecting two or even three devices to the network simultaneously, which places far higher demand on our infrastructure. Within just a few years we have grown from a little over 1,000 connections on our Wi-Fi to more than 4,000. In addition, many these new devices run in permanently connected mode and also run very “chatty” applications such as DropBox. This means that not only is the number of connections growing exponentially, but so too is the total bandwidth requirement.

The good news is, the cost of providing Wi-Fi is coming down. The bad news is, we are constantly refreshing our infrastructure. We constantly playing catch up as students bring their own other devices into the campus.

I am reticent about letting BYOD connect to our internal resources. As a technology team, we have been called overly cautious – but the reality is, if internal systems, such as students’ records, were breached, there would be a storm of finger pointing.

As you add support for teachers to use non-secure devices, such as iPads and Android devices, we have to lower network security. It’s a trade-off and I am not convinced the school leadership understands the risks.

It is very difficult to get teachers and principals to understand the security ramifications of BYOD. As you add support for teachers to use non-secure devices, such as iPads and Android devices, we have to lower network security. It’s a trade-off and I am not convinced the school leadership understands the risks.

Beyond in-school Wi-Fi, I think there are some huge advantages to 3G. We trialled a 3G embedded device for a small set of our students. This has changed the educational aspirations of some of these kids - they have taken home devices and delivered Internet access to locations and homes that have never had this sort of thing before. This may not be necessary across all of the school system, but in some areas, the 3G enabled devices we sent home were first Internet access the family ever had. This an equity gap issue. This raises a very important point. Schools have lost their network monopoly. Students now carry their own network and Internet access via SmartPhones and tablets with 3G and 4G connections. It is ridiculous to think we can actually filter what students have access to while on school grounds. This has huge ramifications for duty of care, and school policies for BYOD.

Devices

Like many schools, we have a one-to-one laptop program. However, the future will clearly be tablets. We will be deploying tablets to primary students. Unfortunately, the purchase of tablets – namely iPads – does not fit within State funding guidelines. These devices’ batteries will not last the mandatory 4 years required under the current funding models.

I am not so sure tablets are the future. In my experience, a tablet does not do everything needed for a lesson. At best, it is a supplementary device.

I could not disagree more. We use multi-touch slates. These are a game changer in education. They cost a bit more, but we get hand writing, scribbling, pictures, and notes from students – everything you can do on paper and all of which is important in education. Windows 8 will change this again as it will make precision, multi-touch slates mass market.

I think you need to make a distinction between tablets and slates. Tablets, like the iPad, are low precision devices and while great for content consumption, they are not really useful for creative learning experiences. Slates allow for handwriting and precision input. They are more appropriate for education.

We have differentiated the models of device based on year levels: years 5, 7, and junior schools have different models. It’s a mix of devices based on the experience of the student. We have small computers for small fingers!
When tablets are used as a collaboration device, not as an "isolation" device, you see much more practical learning going on.

In our junior school we have delivered tablets on a one to two ratio: two students to one tablet. We are finding this ratio delivers far better learning outcomes, as we get more sharing and collaboration between the students. While there was initially more work in developing a curriculum for the one to two ratio, the classroom activity is now delivered more successfully. When tablets are used as a collaboration device, not as an "isolation" device, you see much more practical learning going on.

Software & Licensing

Deployment

When considering BYOD, the big issue is how to get software out to students quickly. Getting software out to students is a prime consideration for BYOD.

Teachers will often locate software that supports their curriculum half way through the year, but IT teams cannot deploy these applications quickly. With centrally managed laptops, any new software only gets deployed when the next upgrade cycle is done – generally during school holidays. BYOD complicates the software distribution model. If we cannot manage the device, we cannot deploy the software teachers need.

That is the wrong way of looking at the problem. With BYOD, students can install whatever they want, which means if they need some software, they can install it right away.

But that also means the teacher loses control over what software is being installed, and what software students are using. It becomes difficult to plan activities.

What is the most important teaching technology for 2012 and beyond?

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<th>Seniority</th>
<th>Gender</th>
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<td>Ultrabook™</td>
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<td>Interactive projector or whiteboard</td>
<td>147</td>
<td>110</td>
<td>220</td>
</tr>
<tr>
<td>Video conferencing</td>
<td>112</td>
<td>110</td>
<td>220</td>
</tr>
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Prepared by Joseph Sweeney, IBRS
Licensing

In addition, software manufacturers cannot agree on licensing deals for BYOD. They still insist we buy “site licenses”, or school licenses, but these assume all computers are owned and controlled by the school. With BYOD, the software is deployed on private computers. It is not clear who is responsible for paying for those licenses, or who is held responsible.

... software manufacturers cannot agree on licensing deals for BYOD.

That is also a big issue with VDI. While we pay for a license for using the software in school, via VDI, when a student uses their own home computer to access the software through VDI, technically we need to purchase another license.

We got hit hard with this. We deployed VDI to enable students to access their work environment on any device. Then Microsoft changed the licensing on us, so we could no longer offer remote access to students... but then they changed the licensing again! This is a real deal-breaker for VDI in education.

I agree licensing is a big problem, but Adobe and Microsoft are starting to get their heads around licensing for student one-to-one computing, although BYOD is still a bit of a problem for them.

In addition to software licensing confusion, you need to consider content. Text book publishers do not have licensing that makes sense. Just like software vendors, a lot of publishers insist you buy school-wide licenses, but do not detail how licensing can work with student-owned devices.

Cloud Services

My biggest concern is the push to cloud services. Cloud services from a school's perspective does not always make commercial sense. In practice, cloud services are actually very expensive.

I could not disagree more! This is the only way that education is going to be able support BYOD in future. In fact, I would say that cloud services will be the primary delivery method for education within five years. This does not mean that we’ll be using public cloud for everything, but it is very likely that our Learning Management Systems and Storage will be Internet-facing, cloud-based services. In addition, students will be using – and are already using – their own public cloud services anyway. It is crazy for us not to embrace these services and give up trying to be technology providers, when we should be first and foremost education providers.

I think there could be a risk going too quickly into the cloud. For example Microsoft’s offer of free Office 365 for education is terrific, but they will not guarantee that this service will remain free. There is a very real possibility that we may get sucked into cloud services, only to find in future that we are held over a barrel for license fees! At the very least, we need to guarantee that such services will remain free, or at a fixed cost, for a number of years – a decade or more.

Support and Maintenance

Supporting a range of devices and keeping them working is a huge challenge in BYOD. With the current one-to-one model where schools purchase a standard device, maintenance is simply a matter of swapping out a battery or the entire device itself. The skills required to maintain the device are narrow. But with BYOD, there are all sorts of brands and devices coming in that we have no real ability to sort out.

But the whole point of BYOD is that users maintain their own device. It is not the school's responsibility.

That is nice in theory, but in education, there is a need for very high uptime. Ensuring students can access the resources in the space of a lesson block, which is 40min, is vital. If a device is not working for 5-10 minutes, it is a substantial interruption to not only the student, but also the teacher and class as a whole.

We’ve found that it is generally the same students over and over again that have issues with their laptops and battery charging. These are the same kids that ‘forget’ their pencils or books. So I argue that this is not a support issue, but rather a behavioural issue.

In our case, we simply give students who do not have a working or charged unit one of the older spare notebooks. Because the older devices are less desirable than their normal device, these students quickly change their behaviour.
We keep enough old computers spare to cater for about 10% of all students at any time. That has been more than enough.

With our BYOD initiative, we have kept old, semi-retired laptops to loan to students when their own device fails. We keep enough old computers spare to cater for about 10% of all students at any time. That has been more than enough.

BYOD may actually help overcome the high rates of damage we’ve had with the NSSCF laptops we deployed to students. People look after a device they own better than one that is handed to them.

A great deal of the maintenance issues can be pushed back to vendors. When we purchased laptops, we also purchased accidental damage protection (ADP) which removed the need for us to have our own technicians. Our cost of ownership for the device over four years effectively goes back to the vendor and we have no on-going costs. The TCO and ownership of device is a three-times its consumer cost, so the four year ADP is very cost-effective, and it also reduces staff and processes.

But when you go with BYOD, you lose the ability to push maintenance back to the vendor with ADP.

Costs & Funding

Saving money is not the objective of BYOD. If you are doing BYOD to save money, you are missing the point. It is really about delivering education in new ways.

The statement that BYOD is not about cost is simplistic. Pedagogical benefits need to be couched in financial reality. There is a utopian vision held by educationalists that funding for education should be whatever it takes, but technical people have to be more realistic. We have budgets that need to stretch across many projects, so we need to focus on what deliver the best student outcomes within a finite budget.

Who is really saying BYOD saves money? It’s the principals and the finance people who claim this. The technologist are not really so sure.

The reality is that BYOD is changing where money is spent. The costs move not only from the procurement of a device out to parents, but also costs move into the back-office support, infrastructure and networking. I have not seen total cost savings in BYOD at all.

If you invest in BYOD for the whole school using VDI, it will be very costly! The problem is that deploying VDI infrastructure to support BYOD requires a heavy investment in both networks and back-end servers. This is all upfront cost. The first two years before you finish deploying BYOD is very expensive and very challenging unless you have a big budget. During this time you need dual management platforms: one for the traditional centrally managed desktop, and one for VDI. However, after a successful VDI deployment, the costs shift to the user, and thus you can recoup the costs back over years 3 to 5.

It is difficult to convince school leadership to pay for infrastructure upfront, then get savings in three to five years. School funding rarely works on anything more than a year or two.

The cost increases mentioned above only really matter when you are trying to control the students’ devices. I think controlling the device is the wrong approach.

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Instead, we should treat BYOD as literally “bring your own device.” That is, students bring their own devices, and the school makes no attempt to manage them. It is the management – things like VDI and Citrix - that add the biggest costs in this equation. Once you realise that you no longer need to manage these devices, that consumerisation has eliminated the need for management, you can start to save some money. But without management, teachers lose control of what the students will be using and what software is available for lessons. Which gets us back to the pedagogy debate.

In future we will not be worried about these issues. Instead, schools will be more like an ISP. Schools will provide access to the Internet, some basic services such as e-mail, calendaring, cloud storage, a Learning Management System, and content. In fact, schools may not even need to offer a network, as many students are bringing their own 3G connections today. We may just end up being a provider of education services across the Internet, into the home and into our school grounds. That would be the pinnacle of BYOD. We would minimise costs on non-core activities – like ICT – while remaining totally focused on what really matters: educational outcomes.

There is another challenge around cost for BYOD: giving up the academic discounts offered by vendors. With BYOD, you lose the ability to negotiate for large-scale volume discounts, and the technology that you do end up buying is quite a bit more expensive. Even worse, the students are now purchasing devices and software at market price, which can be prohibitive. What we end up with is a much greater overall cost base for ICT in education.

**Policy & Duty of Care**

A whole of school and home BYOD policy is essential to making a BYOD program work. We spent almost a year negotiating with and educating parents about our BYOD policy. We had to determine and agree upon policies that clearly articulated what role the school had with regards to managing and protecting student’s device and the student’s access to content. When you lose control of the classroom devices and networks (with 3G) you also lose control of content. We put in place very clear policies regarding “Bring Your Own Other Devices,” such as iPad and smartphones, but rather that treat them as something new, we let parents know that any inappropriate content on these unmanaged devices would be treated in the same way we would deal with any inappropriate content in print form.

The above approach may work for some schools, but in reality, access to the Internet makes things much more complicated. In the past, a kid may have a copy of Playboy in their bag. These days, they have access to far more extreme content.

But this is not a technology issue. It’s a parenting and policy issue. To say that schools can technically do anything about this, when students have their own 3G connections, is ridiculous! Instead of spending huge amounts of effort and money on a technical fix, we must treat this as a policy issue and as a moral development issue. I’d argue that we should be teaching children – and parents – how to self-censor and the ramifications of not doing so.

We take a snapshot of our student’s laptop screens every 15 seconds. This way we know exactly what they are doing. Of course, this is not possible with BYOD.

Surely there must be legal ramifications for running “spyware” of student device?

Yes, for BYOD there would be a concern. However, these are not BYOD devices. They are school-owned devices. And by monitoring them closely, we can ensure that the student remains engaged in classroom activities and quickly detect when they are not. This is more like screen sharing. We also have of data available should there be an issue with child safety. We see this not as a monitoring issue, but rather a child safety issue. Therefore, I see that digital security is as much about child safety as monitoring. So if we go down BYOD, we lose the ability to protect students.

That cat is well out of the bag – the students already have their own devices, in school or out. What we need to do is educate parents as to child safety issues. This is not a BYOD issue. This is a social issue.
In future, schools will be more like an ISP . . .

That would be the pinnacle of BYOD. We would minimise costs on non-core activities – like ICT – while remaining totally focused on what really matters: educational outcomes.
From analysing the interviews and roundtable discussions held during this study, it is evident that making a decision about BYOD in education is not a simple process. There are contrary views – many of which are based on educational philosophies as much as technical issues. In addition, there is no one firm definition of what constitutes BYOD in education. Definitions of BYOD ranged from providing standard devices to students to take home, to completely giving up control of any aspect of the student’s ICT experience.

The one thing all participants in this study agreed upon was that deciding what the “correct course of action for BYOD” was a complex task, and there was much confusion over the issue.

We have identified nine key conversations that can help to bring structure to the BYOD decision. These conversations are not independent from each other, and decisions in one conversation may impact decisions in another. However, by examining each conversation in the order listed here, educational institutions can begin to identify what sort of device deployment approaches will be most acceptable to their institution. These may not be the most economical, nor the best managed, or best aligned to pedagogy. Like all things in life, there will be trade-offs, but by breaking the decision making into specific conversations, some level of clarity can be achieved.

**Pedagogy**

A decision needs to be made as to the pedagogical foundations being sought. This discussion is often philosophically driven, and often a matter a great debate about the purpose of education. For example, education can be viewed as a force for social mobility (arguably the founding principle of Australian and New Zealand’s public school systems). In the last three decades, education has been increasingly viewed as a way to prepare people for the workforce.

These philosophical issues impact teaching practices, which in turn impact decision making for BYOD. For example, if the purpose of education is said to be providing students with workplace skills, then there is a need to explicitly teach the operation of common software solutions in the market: the teacher may demonstrate how to use MYOD (for accounting) or Photoshop (for digital art.) In turn, this approach would necessitate teachers and students having exactly the same computing and software environments.

Alternatively, if the purpose of education is said to be to enable students to be adaptable and have generalised knowledge, the teacher would request students demonstrate knowledge of accounting principles using any software (spread sheets, free accounting solutions, etc.) or any digital art program on any computer or tablet. This, in turn, allows for a far greater range of devices and software, allowing the student to select the tools they wish to use to demonstrate their knowledge.

Decisions around pedagogy greatly impact curriculum development and how student’s progress is assessed.

**Questions to ask:**

- What is the purpose of education in our institution: to assist students to be workforce ready; produce outstanding results on standardised test; provide equity and equal opportunities, etc?
- Are the students best served by demonstrative or experiential learning?
- How does pedagogy impact the types of devices and software required?
- What teacher professional development is required to cause a shift in pedagogy?

**Take Out**

BYOD is more suitable for pedagogies where there is an emphasis on generalised knowledge and demonstrative assessment, and where equity is less of an issue.
Control

Teacher control is closely related to the pedagogy conversation (above) but is worthwhile being debated independently, since it has so much bearing on BYOD decisions.

A key element for BYOD decision making is how much control of content and software the teachers need in the classroom.

The amount of control teachers need over the educational environment is at least in part related to the maturity of the student. Younger students are arguably better served by a more controlled environment, where the teacher can demonstrate specific skills and standardised devices and software, while mature students may be better served by being free to achieve educational outcomes in a wider variety of ways.

A key element for BYOD decision making is how much control of content and software the teachers needs in the classroom.

In addition, the amount of control also increases as the type of education moves from theoretical to skills based. Theoretical education generally needs less control, students can access information on a wide range of devices and from a wide range of sources. Skills training requires much more controlled teaching environment.

The amount of control teachers wield has a direct impact on the need for standardised software and, to a lesser extent, standardised devices. The more control the teacher wishes, the more standardisation of technology is required (and the less likely BYOD will be suitable). The more teachers give up control of how students demonstrate their knowledge, the less standardisation is required.

Questions to ask:
- Is the teacher the font of knowledge or a guide?
- How much control of content and classroom activities does the teacher need?
- Is the teaching related to skills or theory?
- Where does learning take place? Is the intention to have ‘flip classrooms’?

Take Out

Where the learning environment needs to be tightly controlled, BYOD must focus on how to provide the same software or desktop experience for all students, usually through management solutions. This can be achieved through the provision of a fully managed device (eg. a laptop that is managed by products such as Microsoft System Centre Configuration Manager) or by providing a common desktop experience on any device through the use of Virtual Desktop Infrastructure (VDI.)

Where control is given over to students, far less standardisation and management is required in BYOD.

Duty of Care

There are a wide range of duty of care issues that need to be carefully examined prior to any form of ICT deployment to students. These issues include: endpoint security, securing critical educational infrastructure, cyber safety, monitoring, and behaviour management.

Duty of care issues often become red herrings in the discussion around BYOD.

Many of these duty of care issues become red herrings in the discussion around BYOD. Many are frequently used as a way of resisting any moves to open up the students’ digital environment for fear of “security” or “student safety” risks. While these risks are genuine, most can be addressed through good policy, and relatively unobtrusive networking security procedures. During the roundtable discussions we found no instances where security or students taking risks are so great as to completely derail BYOD.
Therefore, the conversation regarding duty of care should focus on what policies and procedures will need to be put in place in order to support BYOD.

**Questions to ask:**
- What policies and procedures would need to be updated in order to support BYOD?
- What back-end services need to be protected and what will be the ideal way of providing this protection?
- To what extent do we need to monitor students activities while online?
- What policies do we have in place to address students bypassing filtered educational networks using their own 3G connections, and at what point is the school responsible for content on the student’s device?

**Take Out**

Duty of care issues should not dictate how students receive their digital tools. However, it is important to recognise that as students bring in more consumer technologies, and move towards bring your own other device (BYOOD), educational policies and security processes will need to be updated.

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**Standardisation**

Standardisation refers to how common the devices, and particularly software, needs to be within a learning environment. Put simply: should all students receive identical devices and software solutions? Of course, there are varying degrees of standardisation. Many schools have opted for specific models tablets for certain years and laptops for others. Other schools have standardised on specific software packages (eg. OneNote) rather than hardware.

There are three issues that greatly influence the discussions regarding standardised devices and software: bulk purchasing power (funding), ease of management, and control of the learning environment.

The more standardisation that occurs both within an institution and also across educational systems, the greater negotiating power education has with vendors. This not only applies to initial procurement of hardware and software, but also the sustainability of maintenance contracts, and value-added support services (eg. sponsored teacher and/or parent training and workshops).

As the number of different devices and software environments increases, so too does complexity, and as a result, the total cost of management increases. Many commercial organisation strive to standardise on only a few models of computer and a known “Standard Operating Environment” (SOE) which contains specific applications to be deployed on these devices. By standardising their environment, on-going management costs are reduced. This is equally true in education, provided that management of the devices is actually required.

Finally, the more control teachers need over the learning environment, the more standardisation benefits the learning environment.

**Questions to ask:**
- What are the savings to the institution, and across our education network, for procuring a standard device and standard software?
- Do we need standardised devices, or just standardised software?
- Do teachers need a highly standard environment in order to maintain control of the learning space?

**Take Out**

Standardisation should not be viewed as a goal in itself. In the age of consumerisation, standardisation is increasingly around software and cloud services, with the choice of device being of little relevance. However, there can be economic advantages for schools procuring in bulk.

Schools may also consider standardising only certain segments of their educational environment: for example providing iPads or Windows 8 tablets to junior years, more powerful slate computers to middle school, and allowing years 11 and 12 to have a full BYOD experience.
Funding

It is just as important to identify where funding for educational devices will come from, as it is to understand how much money is available (or needed) for supporting the deployment of educational devices. In Australia, the NSSCF (which funds the one-to-one student laptop programs in many schools) is likely to be suspended or significantly altered in the near future, and there is currently no clarity as to what future funding models may look like. There is a temptation to view this uncertainty as a driver for BYOD infrastructure: that putting in place management tools (such as VDI) will somehow insulate the schools from any changes in the funding landscape in future.

Unfortunately, this line of thinking confuses funding with management issues. It is better to address the management issues of BYOD through discussions regarding control and the level of standardisation needed in the classroom. Sophisticated management solutions such as VDI require significant upfront spending, with a long-term payoff, so applying these techniques to solve an uncertain future is not workable. This is not to say that VDI does not have a place in education, just that it should not be primarily driven by concerns about the certainty of funding.

It should be noted that the major expenses in deploying devices into education is the management of the devices.

With regards to how much funding is needed, there are many reports from the commercial sector that demonstrate tighter control and management of devices reduces the total cost of ownership. However, if the school’s pedagogy are at odds with a tightly controlled environment, there is little point in spending anything at all on a solution that does not deliver what is needed.

It should be noted that the major expenses in deploying devices into education is the management of the devices. Therefore, if conversations for pedagogy and control suggest that minimal (or no) management of devices is required, then costs plummet and funding can be almost fully externalised to students and guardians. This is an area where educational ICT differs significantly from the commercial sector.

Another issue to address with funding is the significant discounts offered by both hardware and software vendors to educational institutions.

Some funding models result in ownership of the device and software reverting to a private citizen (the student or guardian) which lessens the potential for discounts, and thus raises the overall cost of education for students, even while the educational institutions are reducing their costs. This has significant equity implications.

Questions to ask:

- Are we making long-term decisions based on uncertain future funding models?
- What is the cost of waiting until there is more clarity in funding models?
- If funding is required from parents or via co-funding models, how can equity issues be addressed?
- How does funding impact ownership of the device and software, and how will that drive additional costs for students?

Take Out

Do not rush to change device deployment models due to the lack of uncertainty in funding. BYOD is not a financial panacea, and while it does move some costs out of the education system, it may also incur new costs and consume many of the savings.

Ownership

In the corporate world, BYOD clearly places ownership of the device in the hands of the staff member. However, in education, this relationship is not so clear cut.

For example, many schools purchase devices and provide them to students in such a way that technically the ownership of the device remains with school for a period of time (four years in the case of the NSSCF), while in reality, the student takes on the functional ownership role. In other situations, schools have entered into a co-funding model, where the device is owned by the school, but mainly in order to take advantage of academic discounts from software vendors.
What is interesting to note here, is that the funding model is only loosely coupled to the ownership model. This means that, theoretically at least, even in a true BYOD environment, eg. when a student has procured a device of their choosing and brought into the classroom, the school may still be able to assert ownership of the device, depending upon how agreements (and contracts) a negotiated between the school and the student.

Likewise, it is possible for a school to negotiate a bulk purchasing deal, where students purchase a specific model (or selection of models) and ownership of the device remains with the school.

The key issue for this conversation is, what role should the school play in restoring the students’ devices and software when faults happen?

For schools that take on a high-level of responsibility, the most efficient support service approach appears to be a simple device swap out. If a device is not charged, the battery is quickly replaced. If the device itself is faulty, an identical unit is provided. This type of service approach is possible where there is a highly standardised environment. However, BYOD appears to break this model – although swapping the faulty device for a spare (often older, semi-retired) device is working in some schools.

Another aspect to be considered is how to reduce the need for support in the first place. Product quality is an important factor here (and unfortunately often overlooked in bulk purchases of devices).

Transferring ownership of the device sometimes gets touted as a way to encourage students to take better care of the devices, but in this study, no one actually saw this relationship. Instead, of device ownership leading to better care, less onerous management appeared to provide students with a greater incentive. The more locked down a system, the less likely students are to see the device as of personal value to them. Conversely, the more personal activities the students can perform on the device, the more care they take.

The final aspect of this conversation is who will do the actual support. Some schools report that after moving to BYOD, students provide high levels of peer-to-peer support. Other schools strongly recommended extended onsite vendor support plans. And still others have developed internal staff positions to support student devices.

Questions to ask:
• How quickly do student devices need to be replaced or repaired? Can students be without a device for an extended period of time and still be fully engaged in learning?
• How will the school cope if a student’s device is faulty during the day if BYOD is introduced?
• Who is responsible for repair and support?
• What processes need to be in place for support services?

Support

Supporting devices in an education environment is critical, no matter if the device is school owned or student owned. In K-12, when a student’s device is out of service, the student can be excluded from the lesson or, more likely, the lesson is disrupted as students and the teacher seek a solution.

The conversation around ownership of device is important because it impacts (or may be driven by) funding models, and has a significant impact on software licensing.

Questions to ask:
• Which devices are best owned by the school, and which devices are best owned by the students... and why?
• How will funding models impact ownership, and can changing ownership result in savings, especially with regards to software procurement?
• What are the equity and educational policy ramifications related to ownership of devices?

Take out

The conversation around ownership of device is important because it impacts (or may be driven by) funding models, and has a significant impact on software licensing. In turn, decisions around ownership greatly impact school policies and communication with parents and guardians.

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Take Out

Support should be dictated by the needs of the student to have an appropriate device and software within a specific timeframe.
Management

Management refers to the way in which devices and software are deployed, updated and patched. Often the management conversation is left to ICT professionals, as there are many technical nuances to be addressed. In general, ICT professionals look at management as a way of minimising the total cost of ownership of the device, software and maintenance and support services.

It is important for non-technical people to be involved in the discussion regarding management of the digital learning environment.

However, it is also important for non-technical people to be involved in the discussion regarding management of the digital learning environment. Rather than looking at the technical issues and costs, educators should be articulating what the student and teacher experience should be in the learning context.

For example, if students require highly specialised software (CAD or design applications) on the home PCs, the type of management solution required is quite different than if the students only require access to a web-based learning management solution.

The software being deployed, the type of devices been deployed to, the level of standardisation, and the amount of control teachers need over the digital learning environment, all impact the selection of management tools.

Questions to ask:

- From a student’s perspective, what are the user experience benefits and drawbacks for different management approaches?
- Does the school really need to manage the student’s devices at all? Can students rely upon consumerised devices and manage the environment themselves?
- Will “locking down” a device render it worthless in the minds of students? What is the likely impact of this?

Take Out

Management is no longer simply about constraining costs with regards to keeping devices up-to-date. It is also the mechanism by which students and teachers experience their digital education. Therefore, it is important to clearly understand what students and teachers will find an acceptable user experience. Increasingly, these expectations are being influenced by consumerisation of devices and experience with cloud services “that just work”.

Network

Like management, discussion regarding the network should not be solely the domain of technologists.

The network can be thought of as the one key piece of infrastructure on which every approach to student ICT relies. As such, the selection of any approach of device deployment will greatly influence decisions around the school’s network.

As schools move towards BYOD, the network increasingly becomes the point where security policies are implemented.

However, the move towards BYOD also results in the need to expand the network as students begin to bring in multiple devices. It is important that educational policy makers are aware of the growing costs and increased reliance on the network as students make greater demand of services.

Schools no longer have a monopoly on network access within the school grounds

Another aspect to discuss is the use of students’ 3G and 4G devices. Students are already ‘hot-spotting’ each other – using their phones to share unfiltered network connections in school grounds. This trend is set to grow over the next few years: average mobile data usage has been growing steadily. As such, educators need to take responsibility for being aware of what students are viewing, rather than relying on technical measures.

Questions to ask:

- How fast will the school network need to grow to accommodate multiple devices per student?
- What financial resources must be set aside for network growth?
- What pedagogical, duty of care, behaviour management issues do 3G / 4G connections raise?
- What policies need to be implemented to govern the use of 3G / 4G data connections?

Take out

Schools no longer have a monopoly on network access within the school grounds, and must be ready to provide network services that meet duty of care and security concerns, while not being so onerous as to drive users to their alternative personal 3G / 4G networks.
4 Defining New Models for ICT Deployment in Education
BYOD is a misleading term. In reality, all of the debates and discussions surrounding BYOD are actually related to “how to best deploy applications and services to students and educators, in a highly consumerised technology world”. Or put more simply, how to deliver education digitally in the most effective manner.

However, the focus on the device is unlikely to go away any time soon. The reason for this is that devices represent a tangible and obvious cost, and are often one of the easiest points at which to implement control. The tension between the real discussions that are going on, and the device centred focus, has led to great confusion about the definition of BYOD. Rather than attempt to create a broad definition, we have extracted a number of different definitions from the roundtable discussions with more clearly articulate the wide range of ICT deployment models in education.

These new definitions are helpful when examining the options for future ICT deployment for both students and educators, and directly relate to the “nine conversations” (p18) that we have identified in this document.

**OPD: On Premise Device**

A computing device that is owned by the school and remains on school grounds. These are highly standardised, and benefit from bulk procurement, uniform maintenance and management.

**SOD: School Owned Device**

A device that has been procured and owned by the school, but is given to students, either on a temporary or permanent basis. At the end of life (generally four years) ownership of these devices may be transferred to the student, or the devices be kept or disposed of by the school. Many schools have used SOD in their deployments of one-to-one student laptop programs.

**BYOSD: Bring Your Own Standard Device**

Students procure a device from a limited selection of standardised devices dictated by the school. The devices are most often fully funded and owned by the student, but managed by the school.
BYOOD: Bring Your Own Other Device

The school provides a “baseline” device (usually a laptop or slate computer) through any of the preceding models, but also allows students to bring in other consumer devices and connect these to the schools’ network and services. The bulk of education is delivered through the baseline devices, with students’ other devices acting as supplemental personal tools in the classroom. In general, the baseline device is a fully managed device, while the school takes no responsibility nor management of the students’ other device.

BYOD: Bring Your Own Device

The student procures and owns a device of their own choosing. The school does not manage the device, but may provide a managed educational environment using VDI (virtual desktop infrastructure) or remote access, or provide a web-based learning management system. In many cases the school demands a specific operating system or software solution to be installed on the device (eg. Windows 7 and the Microsoft Office suite).

In an educational environment, it is not uncommon for a BYOD program to be backed up with On Premise Devices (often in labs, or specific classrooms) for intensive applications (graphic design, 3D modelling, and CAD solutions) that are both impractical and expensive for students to install on their own devices.

BYOS: Bring Your Own Stuff

The student procures and owns not only their own device, but also has complete control over the software and services they use within the educational environment.

While this approach may appear similar to BYOD, it does away with any attempt by the school to provide a baseline education environment. The school’s only activities are to provide network connectivity, content through a standard (web-based) Learning Management Environment, and administrative services.

EaaS: Education as a Service

At this point, the school is acting purely as an Internet-based resource for learning. The student selects and owns their device(s), makes a decision on the software they will use, and also provides their own network infrastructure (using 3G or 4G wireless networking).

The school also leverages public cloud services wherever possible: email, calendaring, collaboration, communications, file storage, and potentially the Learning Management Environment are all relegated to public cloud services sourced, but not mandated, by the school.

The school only provides the educational content, access to educators, teaching environment and administration services that are essential for the learning process.
BYOD in education may appear to be a major trend. However, the reality is that few schools have actually moved to a BYOD model, at least not as defined in this report.

Everyone is looking for the ‘One Approach’ that alleviates all of the headaches of providing digital education (changing policies, duty of care, maintenance, etc.) while consuming as little of the scarce ICT budget as possible. In truth, there is not one approach that fits all educational institutions – or even a single approach that can be used across a single school.

From the conversations held during this study, it is apparent that a better way to look at the issue is: what is the best way to deploy digital education services. Behind this lies a more confronting question: what education services do we need to supply... and why? That is the heart of the issue.

If educational institutions were to step back and delve into the issue of what education services they need to supply, and give pedagogically sound rational for such, we may find that many schools – especially those of higher learning – may be better served by supplying as little technology as possible themselves, and adopt a EaaS approach.

It may also be that some areas of education – notably public schools in low socio-economic areas – may need to provide even greater levels of ICT to help close equity gaps in education.

In conclusion, a better approach may be to apply the different deployment models identified in this report with pin-point accuracy to meet specific, localised outcomes, rather than attempting to find a broad ‘best practice.’ The nine conversations should help you to determine exactly what is right for your school and community.

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