

ENHANCING LEARNING THROUGH TECHNOLOGY: CHALLENGES AND RESPONSES

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Abstract

This opening chapter provides an overview of the challenges currently facing educational institutions, particularly universities, with respect to both learners and the array of new and emerging technologies confronting tertiary educators. In addressing these challenges, the perspective taken is an institutional one, illustrating how institutions can act strategically to both encourage innovation and, at the same time, ensure that the technological underpinnings of the learning and teaching environment are stable and supportive. A particular example is used, showing how the development of strategic planning and documentation can guide the three key aspects of governance, policy and process with respect to the use of educational technology.

Introduction

We live in a world of constantly emerging new technologies that challenge the field of education while at the same time present exciting opportunities. Strategic use of new educational technologies can enhance learning and teaching. However, to be effective, new educational technologies need to be supported by innovative pedagogical approaches which in turn enable collaboration, communication and mobility. Such emerging educational technologies include virtual worlds, wireless technology and the spiralling use of mobile devices.

In responding to the challenges, how do educational institutions, in particular universities, investigate and assess the options with respect to creative and innovative use of new technologies in teaching and learning. Typically, universities, though finally recognizing that there is no ‘magic bullet’ that will answer all challenges (Schramm, 1977), still lack a structured approach to collaborative innovation, development and implementation of educational

technologies. This chapter will attempt to discuss and illustrate how institutions can develop a whole-of-university strategy for effective utilization of new technologies to enable an enhancement of learning and teaching, recognizing and reflecting both internal and external contextual factors.

Challenges

Opportunities presented via new educational technologies are inevitably coupled with challenges. Laurillard (2007) points out a range socio-political challenges facing educational endeavours in higher and further education, such as higher standards of attainment, wider participation and lifelong learning.

Apart from the wider socio-political challenges, there are also the more technical challenges related to the introduction and use of new educational technologies. For instance, the sheer range of new technologies presents challenges in making correct selection decisions for specific learning tasks. This is further complicated by the existence of a wide range of software and limitations in infrastructure and resources available to higher education institutions. More specifically, the challenges to learning with technology include being in an information rich age, with the associated open source software developments, social networking tools, mobile devices and increasingly large and complex management systems. Achieving a balance between these and other factors presents a challenge to all educators.

At present, we are in an era where vast amounts of information are being accessed and transmitted electronically. This applies to all aspects of modern life, education (including higher education) and work. Specifically focusing on higher education, the question that may be asked here is: How can learners manage, survive and thrive in an information era? For example, how can teachers present complex concepts more holistically, displaying complex inter-relationships? The movement towards more visual representation of these complexities challenges the traditional textual presentation of information.

Currently, there is a growing trend towards the use of open source software in higher education, but its spread so far has been uneven. This software provides educators with opportunities to adapt and innovate. The leading areas where open source software is applied are, for instance, with respect to university portals, course management systems and student portfolios. Abel (2006) highlights several significant advantages in using open source software, such as the relatively low cost of ownership, integration with the campus infrastructure and security. Abel also points out the main reasons why some higher education institutions have not seriously considered open source

approaches, including a lack of resources for implementation, an unclear future for open source in higher education, satisfaction with current non-open source software (therefore no reason to change), and lack of clarity of associated costs (Abel, 2006).

Further, there is rapidly increasing use of social networking tools, such as blogs, Facebook, myspace among learners. Often these are employed as a form of social support networking. However, the question is to what extent and how students learn through them and thus to what extent these tools should be formally encouraged and used in learning across higher education (Coutts *et al.*, 2007).

Mobile learning devices such as PDAs, the iPhone or wifi are increasingly being implemented for learning and teaching purposes. The question in this context is not what to present in a digital form but how to develop the conventions for serious communication and use in the context of the desired learning environment (Liestol, 2007).

Finally, a contradictory phenomenon is starting to develop in the use of new technologies in higher education. On the one hand, there is a tendency towards standardization – the use of common technologies, whilst at the same time, there is a need for diversification to accommodate the requirements of a widening and diversified range and requirements of the student population (Pincas, 2001). This phenomenon may, for instance, be illustrated by an ongoing discussion concerning the Personal Learning Environments (PLEs) as opposed to the currently used Learning Management Systems (LMSs). Unlike LMSs, which take course-centric view of learning, PLEs are learner-centred. The idea behind PLEs is to enable students to gain a greater control over their own learning. This raises many questions for higher education institutions and how they support learning using technologies (ASCILITE, online source).

These examples illustrate but do not cover all of the extensive number of challenges related to new learning technologies presently facing those involved in higher education. Rather than provide a more comprehensive list, it is more productive to discuss just how to formulate appropriate responses.

Responses

Due to the constantly changing and increasing demands of current modern ways of work, life and also education on teaching and learning, there is a greater need for a progressive change and redesign of teaching and learning environments and spaces. While innovative use of new educational technologies suited for particular purposes can help to fulfil this need, there is an associated imperative

to view the new technologies in light of “proven practices and models of teaching”, the resilient pedagogies, such as feedback and authentic assessment rather than radically claiming to reinvent pedagogy. At the same time, new technology will inevitably impact on the ways in which people learn (Beetham, Sharpe, 2007).

In higher education, the issue of large amounts of data is dealt with through the use of electronic and digital teaching and learning systems and tools. In particular, increasingly visual ways of mapping and navigating information and complex concepts are employed. For instance, portals, as an example of a personal information management (PMI) system, are increasingly seen as one approach to assist learners in navigating information relevant to their enrolment and studies, including the development of personal digital libraries and e-research tools. Such portals have a number of benefits, including:

- Enabling learners to keep personal information and to access it through the Web at any time and any place;
- Improving personal information management; and
- Users can adapt the libraries and tools to suit a variety of activities and purposes, according to their needs and preferences (He & Lu , 2004).

The current use of LMSs in many higher education institutions might need to be supplemented with more personal learning systems, such as through new tools becoming available through open source software such as Sakai and Moodle, to incorporate the needs of the widening and diversified student populations. Part of the emergence of open source solutions is the emerging resistance to the perceived domination, even constraining influence of large-scale learning management systems. Institutions in higher education are opting for the adoption of a network of learning management systems, often purchasing these on the assumptions of supportability, perceived efficiencies and market penetration. However, a subtle but powerful risk is inherent in this decision making. One of those risks is that their use necessitates that teachers adapt their teaching to the features and assumptions of the system, in turn ‘shaping’ the very learning environment. In so doing they may then contradict a basic tenet of educational thought – that educational approaches should arise from an analysis of the learning need and a corresponding matching of an appropriate solution. It is critical to the enjoyment of students and teachers that we encourage the creative development of solutions to specific learning needs, allowing the learning need to shape the learning environment and not vice versa. There remains a creative movement by teachers in higher education to develop

innovative learning environments. These approaches are responsive to specific learning situations, addressing the inherent issues and problems through informed integration of pedagogies and technology. One manifestation of this is the open source movement.

Mobile learning devices, including wireless networking, may also further enhance aspects of higher education teaching and learning experience. Casey (2006) points out that the advent of networked mobile devices makes mobile learning environments a real possibility (also identified more broadly as ubiquitous learning or u-learning to include a range of devices including desktop computers). Increasingly it is achievable to deliver e-learning environments to a range of mobile devices including tablets, PDAs, Pocket PCs and WAP 2 phones. There are many examples of the successful use of mobile devices already including the provision of university results, timetables and reminders by SMS to students. Murphy et al. (2006) described student feedback on a flexible learning initiative that provided course materials and activities for a subject within a Faculty of Information Technology via mobile devices including smart phones. Open source learning management systems (such as Sakai) are also designing for mobile technologies as they continue to refine and develop 'PDA portals', essentially removing iFrames (which are not very accessible/mobility-friendly) and providing functional but simplified views of web pages and navigation menus. There is little doubt that in the near future there will be increasingly powerful, handheld and networked devices that will provide many new and exciting possibilities to educators.

Social networking tools may also contribute to the enhancement of student experience, but they may be best suited as individual/personal tools that students own and use as they need. There is no obligation to see these as enterprise (institutional wide) supported tools, but rather as an increasing suite of personal tools that are used to facilitate learning. This will call for dialogue and discussion between teachers and learners. Do students want to interact with their teachers on Facebook, for example? Do they consider it as 'their space', where teachers should not dare to enter, or will teachers be welcomed by some, if not all, as the relationships between learners and teachers evolve into more collaborative forms?

An essential part of any educational practice is innovation; it can enhance the way in which teachers engage with students. This applies to all modes of learning and teaching, including technology-assisted learning and teaching. Innovation is itself challenging but it may also bring solutions to the range of challenges related to the usage of new educational technology in higher

education. But then the technological innovations, when successful, in turn raise fresh challenges from an institutional perspective. Questions which arise include how is success measured, will it translate across disciplines, how will it impact on existing technological use, and how can it be implemented across the university in a manner that enhances and increases efficiency and effectiveness, rather than just adding another burden to busy teaching staff.

The next section outlines how one particular institution, Monash University in Australia (<http://www.monash.edu/>), is responding to the challenges at an institutional level, in an effort to ensure that the most appropriate technologies are adopted.

The Monash Response

Recognising that the university had let developments in educational technology drift without clear policy and strategic direction, in 2006 Monash established an Educational Technology Committee, and charged it with responsibility for aligning the considerable forces and innovative practices into a cohesive plan. To ensure input from all relevant stakeholders (including technology ‘champions’), committee membership included all faculties, service divisions, the library and student groups, making a total of 25 persons.

At the time, the university had been developing a series of frameworks, the name used for the means of addressing issues and areas of activity which are:

- Complex;
- Cross-portfolio;
- Require conceptualisation and infrastructure support;
- Bring together existing activities; and
- Add new activities to the mix.

One of the first decisions of the Committee was thus to prepare the *Educational Technology Framework*.

By way of background, Monash University, Australia’s largest university, is a significant player in international research and education. New educational technologies may play a pivotal role in enhancing the University’s multiple campuses and international perspectives enabling communication across boundaries. New educational technologies can also complement mobility experiences through seamless platforms for communication and learning (*Educational Technology Framework*, 2007).

Monash is unique among Australia’s research-intensive universities in having multiple campuses, which include one regional, two outer suburban,

three metropolitan and two overseas locations (<http://www.monash.edu/campuses/>). Off-campus learning is also an important mode of education provided by Monash University. New educational technologies may assist and enhance learning and teaching provided across the Monash University campuses, including the off-campus mode of education.

The relevant technologies employed to assist and enhance the needs of the international, multi-campus and off-campus aspects of learning and teaching include learning management systems (LMSs), learning object repositories, collaboration tools (such as desktop and group video and voice conferencing tools), media supporting recording and playback of classes, document-sharing tools, instant messaging etc (*Educational Technology Framework*, 2007).

A particularly successful technological application that Monash has introduced in response to its challenges and context is the Monash Portal. Established as one of the first of its kind in Australia, the my.monash Portal has proved to be extremely popular with students, providing an integrated messaging, academic, administrative and cultural environment for Monash students and staff. It has become the focal point of online access to university services and web resources for practically all Monash students.

Another example of a generic use of new technologies aimed at enhancing teaching and learning developed for teaching and learning needs is Monash University Studies Online (MUSO) system. This is an internet-based teaching and communications platform based on Blackboard Vista. The system was piloted in 2004, and put in service in 2005. MUSO is a web-based course management system that allows students to access information and assessment tasks related to units that they are studying at Monash University. While not all units at Monash offer a MUSO component, it is becoming increasingly popular due to its ease of delivery and accessibility to students (*Educational Technology Framework*, 2007). MUSO is being supplemented in 2007 and 2008 with a suite of other applications, including a number of Monash developed tools and a range of open source systems such as Sakai and Moodle.

One other example of innovative use of new technologies is the application of videoconferencing at Monash University. Videoconferencing is utilised for a wide range of educational, research, administrative and other purposes at Monash University, such as tutorials, lectures, cross-campus committee meetings, collaborative research groups, staff meetings, recruitment interviews, conference participation, and training sessions (Monash University website).

The above examples exemplify large-scale applications that have been introduced across the university. It needs to be emphasised that there is a large

range of small-scale innovative activity with respect to technology, teaching and learning that introduces fresh challenges and opportunities. Examples can be viewed at <http://calt.monash.edu.au/Quality/ETC/project/projectgateway.html>, and include a leading teaching laboratory of the future and a simulated treasury dealing room.

However, there are limitations to innovation. Whilst innovation in the use of new educational technologies is a positive thing, innovative activities need to be monitored as issues of compatibility, access, security and training have an impact on what individuals can achieve using new technologies. These issues are complicated by the broad range of data sources that individuals within the higher education context require access to.

So, within this context, work began on the The Educational Technology Framework, and after a few iterations and presentations to various associated groups and committees, the following structure emerged (see Figure 1).

Overall, the aims of the Framework are to:

- Encourage the creative interest and enthusiasm of staff in exploring rapidly developing educational technologies within the context of Monash University;
- Provide a list of recommendations to guide governance, policy and implementation in educational technology development for Monash University;
- Identify current and emerging requirements for educational technology within the network of Monash campuses;
- Outline how innovation in teaching and learning using educational technology can be encouraged; and
- Inform an implementation plan for the deployment of technologies through the faculties and campuses of Monash.

Its purpose is thus to ensure that the development of technology to advance learning and teaching, and to position Monash as a leader in this field. The aim is for development to be of high quality and to be aligned with the needs of Monash as a research-led, international and multi-campus university, and to establish Monash as a leader in the innovation and application of educational technology in the higher education sector. Innovation and development at Monash will encompass both educational technologies, with emphasis on their role in collaboration, communication and mobility, and innovation in pedagogical approaches to the use of these educational technologies.

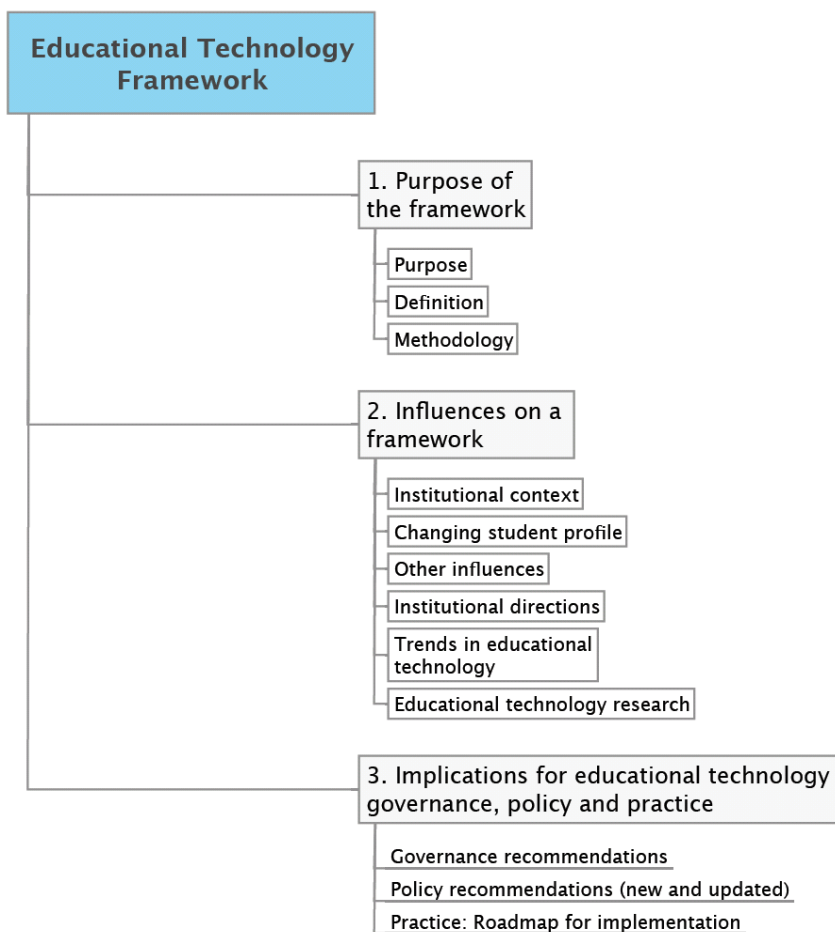


Figure 1. Outline of educational technology framework.

New educational technologies are constantly emerging, and they present unique research opportunities for their application to teaching and learning. Examples of currently emerging educational technologies are virtual worlds, wireless technology and mobile devices. Many small groups and individual Monash staff are researching such technologies in creative and innovative ways. The Framework will provide a vision of this complex interconnected mix of educational concerns, acknowledging that ultimately the success of any educational technology rationale for teaching and learning will rely on creative and collaborative problem solving. The Framework provides a structure through

which planning and goal-setting will underlie future development; that is, it aims to provide a more determined pathway for development to follow (*Educational Technology Framework, 2007, pp. 2, 3*).

A four-stage process was used to develop the framework, incorporating conceptualisation, scoping, consultation and collaboration.

The process incorporated feedback from a diverse range of stakeholders, including:

- Students: undergraduate and graduate student representatives;
- Senior management and staff: the Vice-Chancellor, Deputy Vice-Chancellors and PVCs;
- Faculty representatives: Associate Deans (Teaching) and other faculty stakeholders;
- Campus representatives: PVCs and Academic Directors; and
- Service divisions: Centre for the Advancement of Learning and Teaching, IT Services and the Library.

Feedback was gathered via a variety of mechanisms, including personal interviews, collaborative workshops and submissions from key stakeholders. The end result is a collaboratively drafted document that endeavours to incorporate a broad university view and provides recommendations for governance, policy and practice.

Research

One of the key influences addressed in the Framework is research. Educators draw upon diverse educational theories to enhance their students' learning experiences supported by new technologies. These educational theories range from behaviourism, constructivism, situated learning, conversation theory, activity theory or critical theory. Different forms of technology are suited to the enhancement of different aspects of student learning experiences. Educational technology researchers commonly adopt a range of experimental and qualitative research methods, such as developmental or conversational research approaches. There is no single learning theory, educational technology or research method that is best suited for all learning situations (Jonassen, 2004).

Educational technologies are changing so rapidly that frequently researchers have difficulty to develop pedagogies that would most effectively utilize latest technologies (Laurillard, 2006). However, there are four widely recognized, resilient and well researched and accepted pedagogies for learner-centred technology-supported environments: convenience and flexibility, contextual-

ization, collaboration and communication and constructive feedback. These may form the basis for examining future technologies, an evaluation approach for judging the value of new technologies for a learning and teaching application, particularly for an enterprise wide application,

Convenience and flexibility

Educational technologies have become invaluable in Australian as well as many other universities around the world in providing flexible modes of learning demanded by contemporary students. Most students appreciate the convenience and flexibility provided by new educational technologies, providing ease of learning irrespective of the place or time (Bird, Morgan, O'Reilly, 2007).

Contextualisation

Interactive and adaptive educational technologies enable individual students to contextualize the learning activities to suit their current levels of understanding and personal circumstances, as well as professional aspirations. Contextualising learning activities may enhance student creativity, critical thinking, problem-solving skills and perseverance (Muirhead, 2007).

Collaboration and communication

Educational technologies can be effectively used to promote reciprocity, cooperation and collaboration. Well-structured, skillfully moderated collaborative environments, which value multiple points of view, may foster deep learning (Resta, Lafferriere, 2007). Extending communications beyond the classroom boundaries may equip students with strategies for lifelong learning (McConnell, 2006).

Constructive feedback

The importance of appropriate and timely feedback to facilitate learning is consistently recognized across all educational theories. Students often appreciate the immediacy of feedback and information flow from their lecturers and peers provided by educational technologies. Educational technologies (such as online grade books or technology generated class announcements and result notification) facilitate diverse forms of ongoing and constructive, formative and summative feedback to individuals or groups of students (Mory, 2004).

Generally, new educational technologies may create new pedagogies, and these need to be balanced with the existing resilient pedagogies. The balance in

the use of new pedagogies in combination with the existing pedagogies may be informed by research (Educational Technology Framework, 2007).

The Monash *Educational Technology Framework* (2007) made two recommendations concerning innovative and creative approaches in utilizing new educational technologies:

- a) the need to develop a university policy and procedures in supporting staff to develop and trial new technologies; and
- b) the need to develop a university policy and procedures to ensure effective evaluations of innovations and new developments in educational technology.

As the Framework explains, Monash does not currently provide any co-ordination for innovation, research and development in ET. Innovations tend to be conducted in isolation, with little shared learning and significant possibility of duplication in researching the same or very similar products.

The proposed 'Innovation Support Model' (see Figure 2) aims to provide a more structured approach to supporting the various levels of innovation. At the initial level, isolated individuals are developing innovations or using a service provided from an external vendor (either over the internet or through a temporary licence). Status and results would be recorded in a co-ordinated database/knowledgebase of ETs and their use or potential at the university. Integrated into a web-based teacher support site, it would highlight current activity/practice with links to communities of practice, interest groups or key experts.

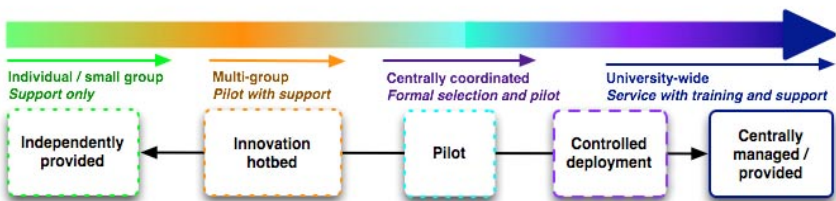


Figure 2. Innovation support model.

Once an activity gains a sufficient level of interest (e.g. across multiple disciplines or faculty boundaries), the activity would be incorporated into the 'innovation hotbed'. The hotbed would provide a common technology environment for innovation activity, allowing teaching staff to focus on their educational innovations while the underlying environment is managed and supported centrally.

In order to provide an efficient, agile environment, the hotbed would still have some limitations (e.g. no integration, formal training, decentralised support, etc.). Evolution from pilot, to controlled deployment and then to a centrally managed/provided service would require a formal, university-level project (with capital funding and change management) to address these limitations. A suitable enterprise-class product would be competitively selected, and a more formal pilot conducted. The pilot would investigate the above factors and other technical issues to provide a recommendation on an appropriate solution for the university.

Evaluation and Quality Assurance

Monash University carries out regular evaluations of quality of teaching and learning and other university services. The approach to quality is based on a 'fitness for purpose' definition of quality and the Monash Quality Cycle: plan, act, evaluate (monitor and review) and improve.

Monash uses a wide range of monitoring mechanisms to assess the effectiveness of its education activities. These include unit evaluations, the Monash Experience Questionnaire (MEQ) and the Course Experience Questionnaire (CEQ). The results of these surveys are increasingly important as many are linked to government funding, such as the Learning and Teaching Performance Fund (LTPF) and more recently awards and grants from the Carrick Institute. These surveys should inform the evaluation of educational technologies in Monash University. For instance, where unit evaluations reveal challenges in providing relevant and timely feedback, that challenge should be considered in the selection and evaluation of new educational technologies. The new technologies have a potential of improving such an aspect.

Further, the Monash Quality Cycle includes an improvement phase. Educational technologies may provide opportunities for faculties to improve results in areas of concern through interventions applying educational technology.

To comply with the Monash Quality Cycle, data needs to be collected and interpreted on an ongoing basis. Such data will provide information for the purposes of program development. In case of gathering information on educational technologies, the collected data may include:

- Surveying students and staff about the use of ICT and educational technologies. Such survey data would provide a valuable measure to assist the evaluation and improvement of programs;

- Benchmarking against the Group of Eight (Go8) and other institutions with exceptional achievements in the area of educational technology.

The Monash Quality Cycle needs to be applied throughout planning, development and implementation of educational technologies (*Educational Technology Framework*, 2007).

Outcomes

As indicated in Figure 1, the Monash University *Educational Technology Framework* (2007) includes a series of recommendations with respect to the governance, policy and practice in the use of educational technology to support the learning and teaching environment. These are not discussed in detail here, as they are peculiar to the Monash context. However, it is worth mentioning that the first recommendation ensures that educational technology governance is firmly placed within the education portfolio.

Given the time, effort and extent of collaboration in the development of the Framework, it is perhaps not surprising that it passed quite quickly and smoothly through the required committee structures at the University. Further, the attention that the creation of the Framework has brought to the proper application of educational technology has been at least partly responsible for increased resources being made available to support its recommendations. Priority areas, such as the development of technologically supported learning spaces, the use of online collaborative tools and the development of e-portfolios have all received strategic initiative funding for at least the next year.

Conclusion

This chapter has provided an overview of the challenges currently facing educational institutions, particularly universities, with respect to both learners and the array of new and emerging technologies confronting tertiary educators. In addressing these challenges, the perspective taken has been an institutional one, illustrating how universities can act strategically to both encourage innovation and, at the same time, ensure that the technological underpinnings of the learning and teaching environment are stable and supportive. A particular example, Monash University, has been used to show how the development of strategic planning and documentation can guide the use of educational technology. At Monash, the *Educational Technology Framework* (2007) has been instrumental in ensuring that the three key aspects of governance, policy

and process with respect to educational technology are properly and usefully addressed.

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