CPA Australia Global Research Perspectives Program

Innovative teaching, learning and assessment in accounting education: Engaging with digital technologies that enhance student learning

Final Report

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List of acronyms used

AACSB	The Association to Advance Collegiate Schools of Business
BYOD	Bring Your Own Device
HE	Higher Education
HEI	Higher Education Institution
ICT	Information Communication Technology
ITS	Intelligent Tutoring System
LO	Learning Objectives/Outcomes
OER	Open Education Resource
OHM	Online Homework Manager
PLN	Personal Learning Network
SNSs	Social Network Sites

Executive Summary

Digital technologies are ubiquitous and pervasive. They are a normal part of our everyday lives, yet present challenges for some in accounting education who were themselves educated in a different era of learning. As Land (2011, p. 66) suggests*: "*Are the long hallowed academic prerequisites of slow time, reflection, tranquillity and solitude in (private) cloistered spaces merely residual factors of an older, analogue print culture that is increasingly irrelevant to a generation comfortable with rapid knowledge sharing, through i-phones and i-pads?"

Our research delivers on our objectives to:

> 1. Investigate and report on best practice in the use of digital technologies that enhance teaching and assessment in business education broadly and accounting education specifically.
>
> 2. Develop and promote resources, including exemplars from the national education sector that inform academics of the potential for digital technologies to develop innovative teaching and assessment focused on evidencing student learning outcomes. The development of the iResource is an example of the possibilities for developing engaging and interactive resources that models potential innovative practices, designed to enhance innovative teaching and assessment.

Key Findings

The key findings as presented in the iResource and Findings Report (Appendix A) can be summarised as follows:

1. **Engagement with technology.** There is a lack of engagement with technology amongst accounting educators. This appears to stem from a range of reasons including: resistance to change and time/workload.
2. **Thoughtful and appropriate use of technology.** Technology use is clearly important in higher education, but the adoption of technology in teaching and learning (T&L) must be linked to a clear purpose which considers the specific ways in which technology enhances student learning and outcomes.
3. **Students like technology.** The literature testifies to the demands and expectations that students have in relation to technology use in their learning. Accounting educators need to be mindful of these expectations and, where they exist, build on the digital skills students have.
4. **The future is technology.** This study, echoing many others, points to the way higher education and T&L has been transformed and continues to be transformed by technology. There is no denying that technology will continue to drive the digital frontier and accounting educators need to embrace the opportunities afforded by technology.

Key Recommendations

1. **Awareness raising amongst academics.** The first recommendation relates to awareness raising amongst academics about the potential of technology and the opportunities it affords

in curriculum design. Students expect technology to be used in their learning. It is how they communicate, collaborate, share knowledge and learn. Employers also expect that graduates arrive in the workplace as digitally skilled. Awareness raising requires communicating the potential of technology at every level, the possibilities of its various mediums (i.e. staff blogs and sharing practice). A key to this is providing access for academics to support and guidance using a just-in-time approach.

2. **Understanding the landscape of choices.** In order for staff to engage with technology, they need to be made aware of the many options available to them and their uses.
3. **Making the appropriate choice.** This relates to best practice in relation to T&L and assessment. Technology use must be thoughtful, intentional and specifically aligned to student learning outcomes.
4. **Implementation.** In order for staff to engage with and adopt technology use in their teaching practice, a range of factors need to be systematised. These include: support for staff, capacity building, sustainability, engagement with a broad range of people and stability of the system.
5. **Evaluation.** The importance of a strong evaluation framework to rigorously assess the impact of technology use on student learning outcomes.

And perhaps a final word from Broad for our contemplation: *"*We are justifiably proud of our unique and diverse system of higher education. We must also have the humility to know that it can be even better*"* (Broad, 2012, p. xii).

Introduction

Focused on improving teaching and assessment practice through the use of digital technologies, this project is part of a movement to effect innovation and excellence in teaching practice in accounting education. This foray into 21st century emerging technologies and their place in educating accounting graduates aligns with CPAs commitment to excellence and innovative thinking (www.cpaaustralia.com.au). The project has made its findings available through an exciting iResource which is both relevant and useful to the CPA membership; particularly accounting educators at various levels of the Higher Education (HE) sector and those involved in Professional Education Programs.

Many believe that HE generally has been slow to recognise the opportunities for innovation and transformation that technology affords, with change generally occurring on the fringe, normally led by individual champions. As business educators, our graduates will be immersed in a technology-rich business environment. We are graduating students for work in a new digital world. They must experience this world and the way that it can shape their learning and understandings. But before the students can learn, we, as business educators, need to reflect on our own skills and consider change.

Significance of Study

In HE, we have increasingly come to understand learning as experiential, socially constructed and interdisciplinary. We cannot assume that learning is confined to a classroom or lecture theatre, or that transmission of knowledge is our role as business educators. For example, assessment using pen and paper rarely measures what students really know. It usually measures what they have learnt to be able to pass the test. Technologies help us to re-imagine how we might assess our students for the knowledge, skills and competencies necessary for employment in the next decade and beyond.

Research Objectives

The objectives of this study were to:

1. Investigate and report on best practice in the use of digital technologies that enhance teaching and assessment in business education broadly and accounting education specifically.

2. Develop and promote resources, including exemplars from the national education sector that inform academics of the potential for digital technologies to develop innovative teaching and assessment focused on evidencing student learning outcomes. The development of the iResource is an example of the possibilities for developing engaging and interactive resources that models potential innovative practices, designed to enhance innovative teaching and assessment.

Project Deliverables

As a project with a strong focus on practical outcomes that will support the use of technologies in the development of innovative teaching and assessment practices, the following were the expected outcomes:

1. An interactive media rich iResource aimed at engaging academics in the findings of the investigation and linked to best practice examples. Examples are focused on the use of technology in accounting programs that have led to innovative teaching practices and/or assessment, thus enhancing student learning outcomes.

2. A final report for CPA Australia and an article for In the Black.

3. A national event to launch the iResource and a report by Deakin University, in association with CPA Australia.

Research Design

Methodology

As an exploratory project designed to have a strong practical outcome (iResource), the research methodology chosen reflects the primary focus.

A qualitative approach underpins this project. The literature review and follow up interviews with innovative educators in accounting education, defined for the purpose of this project as those innovating in teaching and assessment practices using educative technologies, formed the underpinning for the iResource and report. As an exploratory study, gathering current perceptions about digital education and the role it plays in accounting education, along with examples of good practice, was critical.

Data Collection

We have interviewed academics whose practices are defined as exemplary. Interviewees were initially identified by contacting the Head of School (HoS) at each Accounting School in the 39 Australian Higher Education Institutions (HEIs). The HoS at each Accounting School was informed of the purpose of the project, its overall scope and whether they could identify exemplars of innovative digital technology use in their accounting disciplines. From this, 31 academics were identified. These academics were sent emails inviting them to participate in the project. Thirteen academics responded and participated in the interview process.

Throughout the interviews, the experiences of academics with their use of innovative digital technologies was discussed and documented (written/audio/video). Interviews were broadly guided by an interview schedule (see Appendix B).

Data Analysis

Interviews were taped, transcribed and reviewed by two of the three members of the research team to identify thematic groupings and to test for inter-coder reliability. NVivo 10 was used to analyse the interview transcripts. The transcripts were also read and analysed by the Principal Researcher. The findings from the two researchers was then calibrated and cross-checked to ensure inter-coder reliability. These findings have been documented in a Summary Report of the Data Analysis (Appendix A).

The iResource that has been developed as a key deliverable outlines the project, findings, resources and exemplars. This has been designed with media rich and interactive elements to produce a highly engaging iResource.

Meetings

The project team met frequently to discuss the progress of the project and review the status of the project deliverables. Details of key items discussed are provided in Appendix C.

Literature Review

Technology: Transforming higher education

More than twenty years ago, theorists were predicting that technology was going to revolutionise HE and teaching and learning (Cunningham et al. 2000). Certainly, these predictions of the impact that technology would have on HE have proven true. Technological advancements combined with the demand for "reduced costs in education delivery and greater efficiencies" (Tynan et al. 2012, p. 8), have ensured that the uptake of digital technologies in HE has steadily increased over the last twenty years and this upward trend looks set to continue (NMC Horizon Report 2014; Campus Technology 2012; Coaldrake and Stedman 2013; Norton, Sonneman and McGannon 2013). A recent Ernst & Young (2012) report found that, since 2009 "the pace and disruptiveness of change has really accelerated" (p. 9). Contextualising the issue, Tynan et al. (2012) maintain:

> Technological innovation has increased exponentially: since 2000, we have seen the emergence of 'disruptive technologies' such as Wikipedia (2001), with its profound impact on undergraduate research habits; Youtube (2005), with its massive capacity for file sharing and mixed media presentation via applications which enable use by non-programmers; Facebook and Twitter (2006), with their enabling of worldwide and instant communication, and a world of 'friends and followers'. (pp. 8-9).

Collectively, the research suggests technology is now an integral part of education and its constant advancements continue to effect changes in the way curricula is designed and delivered. Tynan et al. (2012) declare that the "advent of digital technologies presaged the end of the traditional university" (p. 8) and the radical changes occurring within HEIs appear to lend credence to this assertion. The literature surrounding technology in HE testifies to the importance of constant innovation in the use of digital technologies. Drawing on a report released by the UK's Institute for Public Policy Research, MacGregor (2013) claims, "A new phase of competitive intensity is emerging, technology is changing and the traditional university is under pressure" (p. 1). MacGregor surmises the report's finding that the next 50 years could be a golden age for higher education, but this will require universities to "seize the initiative and act ambitiously" (2013, p. 1). Barber, Donnelly and Rizvi (2013) similarly contend that the leaders of universities will need to embrace the changes and seize the opportunities that technology is affording, one example being the shift towards Massive Open Online Courses (MOOCs[1]). They further suggest that academic staff will need to move away from traditional teaching methods

[1] MOOCs signalled a challenge to current educational institutions by offering free non-degree online courses, open to unlimited massive global enrolments, irrespective of the learner's existing educational qualifications or capability. Credentialing options include Certificate of Completion, Statement of Accomplishment, Certificate of Mastery, Certificates with Varied Levels of Accomplishment, and Credit for a fee. Examples of MOOCs include EdX (EdX 2013), a collaboration initially with MIT and Harvard University, and Coursera (Coursera, 2013), a partnership of the top 33 universities around the world.
Examples of Accounting related MOOCs offered by Coursera include (Coursera, 2013):

- Principles of Microeconomics (SA) – University of Pennsylvania on Coursera – April 8 (9 weeks)
- Finance (SA) – Stanford on Venture Lab - April 22 (10 weeks)
- Introduction to Finance (CC) – University of Michigan on Coursera - June 3 (TBD weeks)
- Introduction to Finance (CC) – University of Michigan – January 28 (15 weeks)
- Introduction to Financial Accounting Sep 9th 2013 (10 weeks long) offered by Brian J Bushee, University of Pennsylvania https://www.coursera.org/course/accounting

(traditional lectures) to "the multi-faceted teaching possibilities now available" (MacGregor 2013, p. 2).

In 2012, a study by the New Media Commission (NMC), an international group of educational experts, identified the key emerging technologies "likely to have an impact on learning, teaching and creative inquiry in Higher Education in the years ahead" (NMC Horizon Report 2012). According to the study,

> The six technologies identified in the report are grouped into three "horizon" periods: near-term; mid-term; and far-term. Near-term includes technologies to watch in the next 12 months, such as mobile apps and tablets. Mid-term technologies, including game-based learning and learning analytics, are two or three years away from adoption. Far-term technologies are four to five years away from widespread deployment, including gesture-based learning and the internet of Things. (NMC Horizon Report 2012, p. 9)

The general consensus in the literature surrounding the use of digital technologies in HE appears to be that as "education continues to evolve, technology will be at the forefront, driving learner outcomes and transforming instructional practices" (NMC Horizon Report 2012). According to the NMC Horizon Report (2012), there are key trends emerging which are driving these changes. These trends include: openness now has greater value (in terms of open content, open data and open resources); MOOCs are becoming increasingly popularised; workforces are demanding different skills from graduates; there is a move towards using new sources of data for personalised learning; the role of educators is changing; and, finally, educational paradigms are shifting (NMC Horizon Report 2012).

An Ernst & Young (2012) report claims that this transformation is occurring, "for example, through applications that enable real-time student feedback, and the way education is accessed in remote and regional areas – both in the developed and developing world" (p. 9). The report further suggests that digital technologies are also transforming "the way value is created within higher education and related industries. For example, new technologies will enable public and private providers to specialise in parts of the value chain – content generation, content aggregation, mass distribution, certification, commercialisation and so on" (Ernst & Young 2012, p. 9).

Those universities who are able to be innovative, will purportedly "have a distinctive advantage over those who wait for mass adoption or lag behind" (Austrade 2012, p. 19). Innovators in technology usage in education have the power to "shape the education agenda as well as benefit from the positive perception that they are leaders in the online space. Taking an active role in the thinking (if not the application) minimises the likelihood of getting left behind" (Austrade 2012, p. 19).

Universities, in their efforts to remain competitive, have been increasingly turning to the innovations afforded by technology. But what are these innovations? How is technology being used to improve teaching, learning and assessment in HE? What role do staff play in driving technological innovation in HE? What are the barriers to the implementation of such innovation? And what impact is technology having on Accounting Education specifically?

Innovation in Higher Education

In their extensive study of technology, Norton, Sonneman and McGannon (2013) point to a 'wave of innovation' sweeping through HE which is purportedly "affecting both educational technology and the way education providers are organised" (Norton, Sonneman and McGannon 2013, p. 5). It is not

surprising therefore that researchers are increasingly exploring the issue of innovation in HE and its place in teaching and learning (Hannan 2005; Dobbins 2009). Paralleling the intensification of research on innovation, is the popularity of the term itself. According to the AACSB (2010, p. 7), the use of the word 'innovation' is now ubiquitous and has become difficult to define given that "What is meant by 'innovation' seems to have no end or uniformity—as it means different things to different people" (AACSB 2010, p. 7). Consequently, a "common definition is yet to emerge" (AACSB 2010, p. 7).

For the purpose of clarity, when used in this report, 'innovation' refers to new types of technology *or* technology being used in new and improved ways. Innovation, Dobbins maintains, "has become a by-word for 'better', i.e. to innovate is to find a better way of doing something" (2009, p. 415). Spangehl and Hoffman similarly declare, "In virtually all uses, *innovation* implies *positive* change" (2012, p. 18). It is "connected with the ability to change and adapt, and to find more effective ways of doing things" (Dobbins 2009, p. 415). Moreover, it "does not necessarily mean developing ideas completely new to the institution, but may relate to taking existing ideas and adapting them to use within new environments and settings" (Dobbins 2009, p. 415).

The AACSB makes bold claims about the importance of innovation in HEIs: "Simply put, innovation is the most important opportunity for our world, and the reason why every institution should take proactive steps to foster more" (2010, p. 5). The AACSB (2010, p. 3) explains that "innovation is a key strategy for institutions to…thrive and sustain growth into the future." Emphatic in underscoring the importance of technological innovation in education, Pepicello (2012) posits that we now live in a

> dynamic, rapidly evolving society in which access to information has been democratized through technological innovation and in which traditional notions of teaching/learning are no longer relevant to students whose approach to education is pragmatic as much as idealistic. Large impersonal lecture classes that embody the worst of what we know about how knowledge is transmitted and absorbed contrast sharply with the rest of the student's experience with the world, which the internet has made highly personalized. If Amazon can employ a platform that adapts to its users and anticipates their preferences, why can't educational platforms? (p. 49).

In this, Pepicello (2012), among others (BCA 2011), stress that HEIs need to stay abreast of new and improved technological innovations in teaching and learning. Dobbins (2009) similarly claims, "This climate of expansion into HE itself requires innovation in order to develop new methods and new ideas for learning and teaching to suit a student body diversified in aspects ranging from physical attributes…to educational experience and preparedness, geographical location and external responsibilities" (Dobbins 2009, p. 419).

The widening participation agenda has seen a new constituency of learners enter HE (McDonald and Stratten 2001), and this diversification of the student body means that institutions and educators need to consider new approaches to teaching and learning (Dobbins 2009), particularly in light of evidence that suggests that traditional teaching and learning methods (for example, traditional lectures) are not ideal when teaching non-traditional students (Barrington 2004; Toohey 1999). Dobbins (2009) proposes, "It is within this context of needing to find alternative and more effective ways of addressing the student need that the term *innovation* has grown in currency" (p. 415). Institutions are thus having to adapt in terms of their teaching methods and this is where innovative technologies can be of use (Dobbins 2009). eLearning and ICT make distance learning possible for geographically isolated students and this demonstrates how "innovation in teaching methods, delivery, access, and so on, is

vital to the survival of an institution in terms of its ability to meet the needs of a diversified and growing student body" (Dobbins 2009, p. 425).

For innovation to work, however, a number of factors need to be in harmony; namely, demand, supply and financing (AACSB 2010). One of the main barriers to innovation is a lack of institutional support through financing, resources and staff development. Another barrier relates to staff. Many staff are, in fact, found to be resistant to the integration of new technologies into their teaching practice (Senik and Broad 2011). To combat this resistance, academic staff need to be supported adequately. Studies suggest that one of the main barriers to innovation is overloaded academic workloads (Clegg 2003; Barrett and Barrett 2007; Paewai, Meyer and Houston 2007). Staff need to be given appropriate resources and time in order to feel willing and capable of being more innovative in their practice. Some institutions have adopted the idea of Learning Lunches to encourage staff to innovate (Dobbins 2009), and this is just one example of how institutions are working to ensure academic staff become more inclined to use innovative technologies in their practice. A just-in-time (JIT) approach to academic capacity building is key. Inviting busy academies to professional development days scheduled to meet the timetable and commitments of a central staff support group just does not work. Busy academics need access to support JIT, and that means at a time when they are considering a technology, implementing the technology or evaluating the impact.

Further, Spangehl and Hoffman (2012) suggest that the industry's failure to "jump on the bandwagon for the 'latest new thing'" may stem from a desire to preserve what is "an 800+-year old conservative tradition in higher education" (2012, p. 23). Those looking to innovate need to be mindful of these traditions, while championing 'new' technologies. Further, to be effective, innovation has to be sustainable and ongoing. Thor (2012) stresses that innovation must be "a continuous process of improvement and not a moment in time or a satisfying brainstorm session" (p. 60).

Innovation in Accounting Education

The research surrounding technology use in Accounting Education over the last decade has been extensively canvassed by Apostolou et al. (2013), who found evidence of a shift in focus in the research over the years (also see Apostolou et al. 2011). Where once studies were heavily concentrated on distance education (Kohlmeyer, Seese and Sincich 2011; Prinsloo, Muller and Du Plessis 2010), the literature from 2010–2012 is focused on the "technologies used to support coursework, both traditional and distance courses" (Apostolou et al. 2013, p. 21). These technologies include: in-class technologies consisting of computers, tablets and clickers (see Lusher, Huber and Valencia 2002; Carnaghan et al. 2011); technologies used outside the classroom, for example online videos and lectures (Calk et al. 2007; Sargent, Borthick and Lederberg 2011; Theuri, Greer and Turner 2011; Hottzblatt and Tschakert 2011; Fessler 2012), Learning Management Systems (Halabi and De Lange 2011; Duncan, Kenworthy and McNamara 2012), and online homework systems (Khanlarian, Shough and Singh 2010; Gaffney, Ryan and Wurst 2010; Phillips and Johnson 2011) (also see Apostolou et al. 2013; Jones and Wright 2010; Perera and Richardson 2010; Marriott and Teoh 2012; Lillie and Wygal 2011).

Efforts to strengthen the integration of innovative technologies into accounting education are on the rise and are increasingly being explored in the literature (Evans, Buritt and Guthrie 2013; Senik and Broad 2011). Some theorists are exploring alternative uses of computers (Barr and Crawford 1998;

Salleh 2000), while others (Dearing 1997; QAA 2000; IFAC 2007) are looking at the importance placed on accounting graduates having IT skills particularly from the perspective of professional accounting bodies. Much of the literature concentrates on how educators are incorporating technologies into their teaching (Marriott 1992; Sangster 1995; Sangster and Mulligan 1999; Larres and Radcliffe 2000; Broad et al. 2004).

According to Senik and Broad (2011), "Despite these motivated and rigorous efforts, the provision of IT in university teaching and learning of accounting is still lacking compared to the minimum requirement encouraged by professional bodies" (p. 106) (see Albrecht and Sack 2000; Ahmed 2003; Chang and Hwang 2003; Lin et al. 2005; Jones and Abraham 2007). The adoption of innovative digital technologies is also said to be lagging in comparison to other disciplines, and this raises timely questions about the reasons for this lack of uptake in Accounting Education; an issue clearly requiring further research.

A focus on Learning Outcomes

Competitive pressures to attract students to institutions undoubtedly influence the uptake of technological innovation in HE. However, the important questions at the crux of these innovations are: What is the impact on student learning outcomes? Does the adoption of digital technologies actually improve learning outcomes and enhance student achievement?

With the mounting number of innovative technologies being introduced in university classrooms, there is a clear need to examine whether these innovations are actually improving and enhancing student performance and learning outcomes. This is a question increasingly appearing in the literature around technology in teaching (Aldamen and Duncan 2013; Bawaneh 2011; Carnaghan and Webb 2007; Grabinski, Krasodomska and Kedzior 2013; Kember et al. 2010; Kenny and McNaught 2000; Kuh and Hu 2001; Kuh and Vesper 2001; Lopes, Capelo and Mata 2013; Robinson and Hullinger 2008; Tamim et al. 2011). Kember et al. (2010, p. 1183) stress the importance of asking whether the outcomes justify the means given that a "great deal of time and resources are being devoted" to the introduction of new technologies. "The question is worth asking," they continue, "as there is consistent evidence that use of the Internet, or any new medium for that matter, does not automatically result in better learning" (Kember et al. 2010, p. 1184). Tamim et al. (2011) also posit that attempting to answer the question of the effect of new technologies is a relevant one "as we enter an age of practice and research in which nearly every classroom has some form of computer support" (p. 16).

The general HE literature provides many studies exploring the issue of technology in education relating specifically to learning outcomes and the effectiveness of technology. There is a notable paucity in this literature in regards to the impact of technology on learning outcomes. While some studies detail improved learning outcomes, others counter this finding. Generally, the results in terms of the impact of technology on student learning outcomes tend to be mixed (Bernard et al. 2004; Sitzmann et al. 2006; Biktimirov and Klassen 2005; Cooper, Robinson and Patall 2006; Lindquiest and Olsen 2007).

Studies surrounding the various technologies and uses of technology and their benefits to student learning outcomes are extensive (Ai-Lim Lee, Wong and Fung 2010; Chen et al. 2010; Perera and Richardson 2010). Several studies show that students today view technology in their education as having a positive impact on their learning. Norton, Sonnemann and McGabbin (2013) refer to recent

surveys conducted in Australia which found that over 80 per cent of HE graduates found technology was "used effectively for learning" (p. 23). Writing about virtual groups in accounting education, Chen, Jones and Moreland (2010) found that the learning benefits of virtual group work outweigh any disadvantages. Premuroso, Tong and Beed (2011) found significant improvements in the exam performance of students. Baxter and Thibodeau (2011) explored Intelligent Learning and Assessment Software and whether it enhances learning outcomes. Their analysis of 103 students' exam results indicate that those who used the software performed significantly better. Perera and Richardson (2010) similarly point to improved learning outcomes stemming from the use of online resources within a course web site as determined through exam results. Meanwhile, Dillard-Eggers et al. (2008) found based on student results, online homework increases student performance (also see Gaffney, Ryan and Wurst 2010).

While other studies (Conole and Alevizou 2010) have also identified improvements to learning outcomes, they posit that the challenges associated with new technologies cannot be overlooked. The challenges, as delineated by Conole and Alevizou (2010), include: the blurring of boundaries of information control; issues about the legitimacy of information made available through new technologies; the potential of cognitive overload of web knowledge; and, difficulties processing and determining what is relevant content. There are also those who claim that technology has limited impact on student learning outcomes (Johnson and Aragon 2003; Kember et al. 2010). In their review of the literature, Johnson and Aragon (2003), found that the use of technology in teaching has no major impact on learning outcomes.

A smaller number of these studies look at the issue of learning outcomes in accounting education specifically and, in line with the HE literature, they feature mixed results (Abdel-Azim 2006; Chen, Jones and Moreland 2010; Edmonds and Edmonds 2010; Hornik and Thornburg 2010; Huh et al. 2010; Khanlarian, Shough and Singh 2010; Potter and Johnston 2006).

What becomes apparent from an analysis of the literature surrounding technology and student learning outcomes is that there is no clear-cut answer as to whether technologies in teaching categorically improves learning outcomes. Tamim et al. (2011) contextualise the complexity of the research:

> …literally thousands of comparisons between computing and noncomputing classrooms, ranging from kindergarten to graduate school, have been made since the late 1960s. And not surprisingly, these studies have been meta-analyzed at intervals since then in an attempt to characterize the effects of new computer technologies as they emerged. More than 60 meta-analyses have appeared in the literature since 1980, each focusing on a specific question addressing different aspects such as subject matter, grade level, and type of technology. Although each of the published meta-analyses provides a valuable piece of information, no single one is capable of answering the overarching question of the overall impact of technology use on student achievement. (p. 5)

These mixed results in the literature seem to support Kember et al.'s (2010) assertion that perhaps other rationales, "other than improving student learning outcomes," for using new technologies in teaching are required. While the results are mixed there is evidence of improved learning outcomes and this is why so many advocate for the use of technology in teaching and learning. The adoption of innovative digital technologies is important in the modern HEI environment. However, there are some significant factors to consider.

Chen et al. (2010) note that incorporating "information technology alone will not lead to student success. Instead, educators must utilize technology as a lever to promote student engagement in order to maximize the power of computers and information technology as a catalyst for student success" (p. 1223). Prosser (2000) also stresses this point, suggesting that student learning outcomes will be dependent on the *use* of the technologies, rather than the technologies themselves. It is about students understanding the aims and purposes of the technology in their learning and how it relates to their learning (Prosser 2000).

Interestingly, many of the aforementioned studies use student perceptions gauged through surveys, questionnaires, course evaluations, and even narrative remarks (see Berry 2009; Conole et al. 2008) to determine learning outcomes and effectiveness of the technology used (Abdel-Azim 2006; Chen, Jones and Moreland 2010; Gaffney, Ryan and Wurst 2010; Khanlarian, Shough and Singh 2010). Not surprisingly, some theorists stress the need for additional research "that examines performance measured such as exam scores, absenteeism, or drop out rates as opposed to students perceptions" (Edmonds and Edmonds 2008, p. 99). Kember et al. (2010, p. 1185) argue, "There appear to be few attempts to empirically test learning outcomes." There are those, however, that combine an exploration of student perceptions with a more evidential base consisting of students grades (Abdel-Azim 2006; Edmonds and Edmonds 2008; McDowall and Jackling 2006; Premuroso, Tong and Beed 2011).

Another important factor to consider, as explained by Prosser (2000), is that the developments in technologies "are occurring faster than they can be properly evaluated" (p. 1). Thus, we may conclude that technology will always stay ahead of the research.

Technology and Students: The "Connected" Generation?

Many reports and studies have emerged in recent years discussing students in the current era and how their expectations, preferences and demands have evolved in line with technological advancements (Kennedy 2009; NMC Horizon Report 2014). These reports refer to the use of digital technologies as crucial for the incoming generation of students—those frequently categorised as 'digital natives' (Prensky 2001). Friedrich et al. (2010) provide a particularly insightful view into this so-called generation C—the digital natives who are "connected, communicating, content-centric, computerized, community-oriented, always clicking" (p. 2). They claim:

> As they grow up, this highly connected generation will live "online" most of their waking hours, comfortably participate in social networks with several hundred or more contacts, generate and consume vast amounts of formerly private information, and carry with them a sophisticated "personal cloud" that identifies them in the converged online and offline worlds. (Friedrich et al. 2010, p. 1)

According to Margaryan, Littlejohn and Vojt (2011), many profess that, "not only does this generation have sophisticated skills in using digital technologies, but also that, through their exposure to these technologies, they have developed radically new cognitive capacities and learning styles" (p. 429). Adopting this view, Moura and Carvalho (2010) explain, using technology as a learning tool with the incoming generation of students makes sense, given that it does not require technical training on behalf of students (also see NMC Horizon Report 2012). As evidenced in the literature, many theorists operate on this assumption about the technological savvy and know-how of so-called 'digital natives'.

However, Margaryan, Littlejohn and Vojt (2011, p. 429) warn that such claims have no "empirical basis to them" despite being well-publicised and uncritically accepted. Several studies in fact counter these suppositions about digital natives and learners in the twenty-first century (Bennett, Maton and Kervin 2008; Schulmeister 2014; Selwyn 2009). These studies call for more "robust evidence to substantiate the debate and to provide an accurate portrayal of technology adoption among students" (Margaryan, Littlejohn and Vojt 2011, p. 429). Kennedy et al. (2008) are one example, reasoning that just because students use certain technologies in their everyday, does not necessarily translate to them desiring such technologies in their studies, and that theorists should avoid making assumptions about students. They argue "some students may not have had enough experience with a technology to envisage how it could be usefully applied. Also it is difficult to expect students to have the expertise to judge how to best use emerging technologies for educational purposes" (p. 119). Kirkwood and Price (2005) similarly caution that "it is not technologies, but educational purposes and pedagogy that must provide the lead, with students understanding not only how to work with ICTs, but why it is of benefit for them to do so" (p. 257). Here, academics play a crucial role because it will be their knowledge of the value of the technology to improving student learning outcomes that must first be clearly understood by them, and then clearly (and convincingly if necessary) communicated to students.

Coinciding with the rise of studies exploring the so-called 'connected' generation and 'digital natives,' is the increase in research warning against sensationalistic calls for transformation in HE and claims that students nowadays are radically different. Indeed, Margaryan, Littlejohn and Vojt (2011) argue that while calls for transformation and change are legitimate, it would be misleading to suggest that educational change is required because students have vastly different patterns of learning and technology use. Their suggestion for a more measured approach to the issue is echoed in the literature (see Bennett, Maton and Kervin 2008; Kennedy et al. 2008; Schulmeister 2014; Selwyn 2009).

Despite the criticisms, the overwhelming majority of critics seem to think that the entry of 'connected' students must translate to a transformation in the way HEIs use technology. A recent study by Austrade (2012) found "students globally are demanding the use of technology to make classroom time more effective. As technology now enables on-demand access to information and interactive online experiences, learners are also demanding on-demand and interactive learning experiences" (p. 6). Friedrich et al. (2010, p. 1), give voice to the popular view that in order to ensure their own longevity and sustainability in the technological era, HEIs will need to "refocus on what it takes to thrive in the Generation C environment."

Online Education

Advancements in technology and the demands of the "connected" generation have translated to significant changes in the way education is delivered. More and more HEIs are offering distance education and online learning, which has increased accessibility and flexibility for students from regional areas and those unable to attend a campus for classes (see Bryant, Kahle and Schafer 2005; Evans 2008; James et al. 2010; Norton, Sonneman and McGannon 2013; Perreault et al. 2008; Millson and Wilemon 2008). Online education may entail lectures, tutorials, computer generated feedback, exams and group projects being undertaken online (Norton, Sonneman and McGannon 2013). Norton, Sonneman and McGannon (2013, p. 20) suggest, "When done well, online approaches can actively engage and challenge students. Technology can now provide immediate, nuanced feedback on

student progress, drill down in areas of misunderstanding, tailor curriculum to personal needs, and create new ways for students to interact with their peers and teachers—all factors known to drive learning effectiveness." It is not surprising then, that more universities are using their online education offerings "to attract students, either out of necessity due to competition, or the desire to grow programs in new ways" (Chen, Jones and Moreland 2010, p. 2). Chen, Jones and Moreland (2010) explain that the trend towards online training and learning is both worldwide and extends beyond the parameters of HEIs to professional firms and associations also (see Jennings 2006; Krause 2009; Love and Fry 2006).

Chen, Jones and Moreland (2010), used a survey to examine online and traditional classroom student's perceptions of instruction, student-student and student-teacher interactions. While the online students were very positive about their learning experience, they ultimately found that "the traditional learning approach provided a level of richness to the student experience that was not matched in the online approach" (p. 4). Other studies have similarly found that those in the traditional classroom environment outperform students who undertake online learning (see Ponzurick, France and Logar 2000; Priluck 2004; Terry et al. 2001).

However, several studies counter this finding, instead concluding that online education is as effective as traditional classroom learning (Iverson, Colky and Cyboran 2005; Jones, Moeeni and Ruby 2005). For the most part, "the results tend to be mixed" (Chen, Jones and Moreland 2010, pp. 2-3). Opinion varies in relation to the benefits and disadvantages of online education in terms of learning outcomes, inputs (teaching methods, assessment and learning styles) and learning processes (Arbaugh et al. 2009; Chen, Jones and Moreland 2010; Love and Fry 2006). Norton explains:

> While a vast amount of research exists on online education, only a handful of empirical studies are rigorous in design...The limited amount of hard data means it is difficult to draw firm conclusions on the effectiveness of learning online compared to traditional formats. It is also difficult to generalise about the quality of 'online education' given the wide variety of technologies and mixed formats it encompasses. New technologies are constantly developing, and the evidence base is always catching up. (2013, p. 22)

Despite the mixed results, the consensus is that online education is here to stay and the focus needs to be firmly concentrated on how technology can drive effective learning in HE (Norton 2013).

Barriers to Technology-enhanced Innovation in HE

The key barriers facing the advancement of learning technologies consist of budget constraints, technical issues and lack of interest of academics (Schneckenberg 2009). According to Schneckenberg (2009), it is the latter which proves the major barrier to the introduction and adoption of innovative technologies (also see Allen and Seaman 2007).

In their extensive study of technology enhanced learning in HE in the UK, Browne et al. (2008) concluded that the availability of internal funding was a significant part of improving the implementation of technology enhanced learning in HE (also see Norton, Sonneman and McGannon 2013). They maintain that "funding has assumed an even greater significance over time as a means of enabling development" (Browne et al. 2008, p. 7).

Browne et al. (2008) also found that having a committed champion at an institution was "the strongest influence on the rate at which technology enhanced learning is developed" (p. 7). From a European

perspective, Schneckenberg (2009) finds that the rate of adoption of eLearning is disappointing and he explains why academics play such a significant role:

> Academic staff play a key role in the underdeveloped state of eLearning in higher education. Kerres et al. (2005) argue that faculty members are the process owners, the gatekeepers of research and teaching in universities. Academic staff define the (subject) curricula, they plan study programmes and individual courses, and they communicate and interact with students in teaching and learning scenarios. While this key role of faculty in universities has not changed, the pervasive nature of ICT has driven the evolution of eLearning as strategic issue for the innovation of higher education. Academic staff are nowadays facing new pedagogical challenges: they have to design learning environments which respond to the changing needs of technology-savvy students; and they have to integrate ICT into their courses to extend the flexibility of educational services in universities. But does faculty have the competences to respond to these challenges? (p. 413)

Schneckenberg's (2009) observation is five years old and begs the question: have things improved since then? From our review of the literature, particularly surrounding Accounting Education, it appears that adoption by academics of innovative digital technologies remains limited. Whether this is a result of their competence in relation to technology or something else, requires further analysis. Many theorists attribute this to the competences—or lack of—of academic staff in relation to technology (Bates 2000; Euler 2004; Hagner and Schneebeck 2001; Allen and Seaman 2007). According to Schneckenberg (2009), these studies collectively agree that many academic staff lack "the competence that enables them to know and to judge why, when and how to use ICT in education" (p. 413). This may be a result of inadequate training which tends to take the form of two to three day seminars which have been found to be time-consuming, expensive, limited in scope and ultimately ineffective (see Bates 2000; Euler 2004; Salmon 2005).

Technology in Accounting Education

As evidenced above, the research surrounding innovative digital technologies in the general HE literature is prolific. A canvassing of this literature reveals that the research in accounting education relating to the impact of technology and its impact on learning outcomes is, in contrast, sparse (Bryant et al. 2005). And while the general HE literature is broad, Arbaugh et al. (2005) claim that it may not be wise to extrapolate from these studies given that they may not necessarily apply to the technical field of accounting. This section of the literature overview documents the most recent studies which explore digital technologies being used by educators in accounting.

With few exceptions (Beaghan 2007; Chen and Jones 2007; Gagne and Shephard 2001; Vamosi, Pierce and Slotkin 2004; Jones and Chen 2008), there are limited studies which focus on online learning in the field of accounting (Chen, Jones and Moreland 2010).

Some of these studies explore online learning, assessing its benefits and limitations, and how it compares to more traditional teaching and learning approaches. Hiralaal (2012) discusses how blended learning, a combination of online and face-to-face interaction was implemented in an accounting class to assess the impact of eLearning through students' perceptions (also see Magnier-Watanabe et al. 2011). Results point to significant improvements in student performance, higher motivation levels, increased levels of independence and deeper understanding of subject matter. This study provides insight into the many advantages associated with eLearning. A study by Rich and Dereshiwsky (2011) found that there was no difference in performance between students in online

courses compared to those on-campus. Also setting out to measure if there was a difference between learning outcomes of students on-campus versus those enrolled in online accounting courses, Connor (2009) found no difference in student perceptions of overall learning outcomes. However, the traditional students were found to be more confident than online students in relation to their understanding of accounting concepts. Catalysed by the fact half of all Australian universities use online lectures, Ye, Coram and Hronsky (2012) undertook a study of Lectopia, and found that online lectures are efficient and flexible and also facilitate the dissemination of information.

Offering a contemporaneous insight, Arquero and Romero-Frias (2013) discuss the impact of Web 2.0 in accounting education and look at the use of social network sites (SNSs) to support student engagement with the course and develop basic skills. They measured the learning outcomes by examining student usage of the SNS, student perceptions and through overall grades. They found that high use of SNSs correlated with better performance from students as evidenced in students' overall grades. Interestingly, unlike the essays in which students showed significant improvement, the exam grades showed little improvement and the researchers attribute this to exams being rigid and focused only on content.

Other studies offer an insight into the specific digital technologies and devices being used in accounting education at universities around the world. Phillips and Sheehan (2013) for example, describe an innovative pedagogical tool—text-to-video animation software—which accounting educators are using to model accounting workplace interactions. They argue that a variety of learning outcomes are being addressed by these videos, including soft skills like adaptability, decision making, how to act like a professional, objectivity and independence. Phillips and Sheehan (2013) see the benefit of this technological tool as extending the abilities of graduates beyond just technical competencies. Chui, Martin and Pike (2013) explore Student Response Systems (SRSs), often called "clickers", as an innovative learning method to improve learning outcomes. Their findings suggest that students view the use of clickers as beneficial to their learning. Richardson et al. (2013) set out to assess the benefits of using mobile devices—specifically, iPods—as part of the online learning experience of students. Their findings indicate that students were positive toward iPods being used as part of their learning and that the use of the mobile device made studying more efficient and effective.

Weil, McGuigan and Kern (2011) investigated an online discussion forum as a way to facilitate case-based learning. Surveys were used to collect student perceptions of the benefits and limitations of case studies and the use of online discussion forums. It was found that students were overall very positive towards the use of discussion forums as a delivery platform to augment case-based learning. Students indicated they benefited from being exposed to other students' opinions, that their ability to critically review case information improved, and that the technology made learning much more convenient.

A study by Jebeile and Abeysekera (2010) canvassed the spread of ICT innovation in accounting education, looking specifically at an interactive online computer-assisted learning module, called WEBLEARN. Using questionnaires, they collected student perceptions of the online learning module and their findings indicate that the majority of students saw the online module as advantageous and easy to use. In terms of assessment, Marriot (2009) looked at student evaluations of online summative assessment in a financial accounting module. Seeing the opportunities afforded by e-assessment, including student engagement and motivation, Marriot (2009) sought to explore student perceptions

of e-assessment. She found that students perceived e-assessment as having a beneficial impact on their learning, engagement and motivation.

Investigating accounting education in Turkey, Bozok (2011) set out to determine the effects of distance education materials on accounting students. Bozok (2011) found that the grades of students suggest distance education materials had a positive impact and was beneficial to both students and instructors. Also seeking to investigate student perceptions of online resources and materials, Blount and McNeill (2011) explored the effectiveness of online resources which accompany textbooks from the perspective of postgraduate students. Students were found to report positive experiences with the online resources, however, there were clear technical issues which created a barrier to their effectiveness and, as a result, many students did not engage with the optional resources. Blount and McNeill (2011) concluded that while such online resources may be readily available and easy to use, it was imperative that they be integrated into the curriculum and that students are supported in their use.

Hahn, Fairchild and Dowis (2013) explored the use of an Online Homework Manager (OHM) and intelligent tutoring system (ITS) in an introductory accounting course to determine their usefulness as supplemental teaching tools. In contrast to the bulk of other studies, they found no learning advantages associated with either of the tools.

Many of the recent studies to emerge from the field of accounting explore student perceptions of online learning, digital technologies and innovation in relation to their experience of learning (see Apostolou, Blue and Daigle 2009; Jones 2008). For the most part, these studies suggest that students are overwhelmingly positive towards the technology operating as both a delivery platform and tool in their education. However, like the varied opinions which feature within the general HE literature, some of these accounting education studies argue that online education is as effective as traditional classroom education (see Chen and Jones 2007; Gagne and Shepherd 2001), while others claim distance education is not as effective (Vamosi, Pierce and Slotkin 2004). Overall, though, from this research emerges a picture of a discipline which has been somewhat slow to adopt the truly innovative digital technologies available to educators. This obviously raises questions about the place and impact of technology on accounting education.

Technology in HE: Where to from here?

The changes to the HE landscape brought about by technological advancements are ensuring that education—how it is delivered and supported—has been irrevocably transformed by digital technologies. According to Norton (2013)

> Almost every day the world's higher education media carries another story about new educational technology….With so many new ideas and products, it is impossible to tell exactly what higher education will look like in ten or twenty years. Many of today's prominent higher education brands will probably still exist, but the educational experience they offer will have greatly changed. (p. 52)

While digital technologies have the power to improve teaching, learning and assessment outcomes, they are not without their disadvantages and limitations. As discussed above, criticisms are often levelled at those who assume *all* students are technologically savvy and desire innovative digital technologies in their learning. However, research shows this is not always the case and such assumptions are hazardous.

Learner readiness for online learning is a crucial step to effective learning and teaching online (Hughes, 2011). The significance of creating a supportive learning space for online learners is due to the fact that the learner carries a set of skills, experiences, and expectations to the learning space (Hughes 2011). Hughes (2011) further explains that online readiness for learners means ensuring that learners are supported by means of their expectations, providing information and administrative support, access to technological troubleshooting support, study skills assistance, and access and support for students with disabilities. Another criticism is that the radical shift towards online learning, and particularly wholly online degrees, is problematic from the perspective of employers. Dodd (2013) claims that not only is moving to online education incredibly expensive, but "employees are not ready to accept graduates with wholly online degrees" (p. 1). Those that are wary of wholly online degrees suggest that students without on-campus experience may lack certain skills developed by hands-on experience such as group work, communication and presentation skills (Dodd 2013). Another criticism associated with the uptake of digital technologies is the workload implications for staff (Tynan, Ryan and Lamont-Mills 2013; Tynan et al. 2012). Research points to the impact of the amount of time staff spend on online discussions (James, Krause and Jennings 2010) and the very real, human costs of e-teaching (Coates et al. 2009; Snyder, Marginson and Lewis 2007). According to Snyder, Marginson and Lewis (2007), technology is producing staff "weary from increased work demands associated with the innovations" (p. 201).

The literature surrounding the transformational capability of digital technologies to education is prolific. This body of literature indicates that technology is here to stay, is ever-changing and if HEIs wish to stay competitive in the twenty-first century, they will embrace these changes.

Digital Technologies for Enhanced Student Learning

Digital technologies play a key role in facilitating and supporting student learning. 'Digital technologies are electronic tools, systems, devices and resources that generate, store or process data. These includes social media, online games and applications, multimedia, productivity applications, cloud computing, interoperable systems and mobile devices' (DEECD, 2014). The terms 'technology-enhanced learning' or 'eLearning' is often referred to as a type of learning that is facilitated and supported by technology. The use of digital technologies does not only enhance traditional ways of teaching but also exposes learners to new and different ways of learning. Digital technologies facilitate a shared learning environment by: enabling learners to collaborate in establishing communities of learners that go beyond the classroom; support the formation of learning environments and resources that cater for different learning styles and approaches; and, ultimately provide students with different learning experiences. Digital technologies support innovation in the delivery of content, assessment design, and adaptive learning approaches that are focussed on the individual student unique learning style and needs. They provide an opportunity to better understand our students and the way they learn. Further they support teachers to design and adapt their curriculum design and delivery styles, tailored to the students' individual learning preferences.

In this section, various forms of digital technologies and the ways in which they enhance student learning are presented.

Digital Technologies for Collaborative Learning

Web 2.0 technologies and applications have had a significant impact on HE and teaching, learning and assessment (Arquero and Romero Frias 2013; Koh, Herring and Hew 2010; Hemmi and Land 2009; Grosseck 2009; Huang, Hood and Yoo 2013). Research suggests that Web 2.0 technologies have the potential to significantly enhance teaching and learning (see Grosseck 2009; Kerrawalla et al. 2008; Turney et al. 2009). They are seen as having collaborative potential (Carmichael and Burchmore 2010; Kearn et al. 2010; Shepard 2012), as well as being useable and sociable (Kearn et al. 2010). Augustsson (2010) maintains that Web 2.0 has significant potential in terms of: 1) promoting self-reflection on behalf of students; 2) enhancing collaboration; and 3) developing student self-awareness (also see Grosseck 2009). Kassens-Noor (2012, p. 10) surmises that with the advent of Web 2.0 technologies, "cyberspace has offered new communication spaces for informal and active learning activities and also altered how information is transmitted among students. Hicks and Graver (2010, p. 627) hypothesize that Web 2.0 might have created a different 'learning and information reality' compared with the traditional reflective and collaborative discourse" (also see Grosseck 2009). The most "frequently used Web 2.0 applications include wikis (Wikipedia.org), podcasts (youtube.com), blogs (blogspot.com), and social networking sites (facebook.com, Twitter.com). Especially in recent years, social networking sites have seen an explosive growth as a way of communication" (Kassens-Noor 2012, p. 10) (also see McGarr 2009).

A range of digital technologies are available to enable learners to collaborate and interact with their peers and educators across the globe using the web. Social networking sites (SNSs), such as Facebook and Twitter, have become increasingly popular in HE as a teaching and learning tool (Arquero and Romero-Frias 2013; Kassens-Noor 2012; Mason and Rennie 2008; Roblyer et al. 2010). Findings have

shown that they enhance student engagement (Arquero and Romero-Frias 2013; Arnold and Paulis 2010) and foster collaboration (Augustsson 2010). Further studies show that students have positive experiences and perceptions of the use of SNSs in HE (Arquero and Romero-Frias 2013). The use of wikis for educational purposes is also being increasingly explored (Hemmi, Bayne and Land 2009; Trentin 2009; Malloch 2005). Research suggests that wikis have enormous collaborative potential for students (Trentin 2009; Kearn et al. 2010), and that they allow students to be actively involved in their own knowledge construction (Trentin 2009). Many theorists foreground the significant potential that weblogs and blogging have for teaching and learning (see Hemmi, Bayne and Land 2009; Kang, Bonk and Kim 2011; Kerrawalla et al. 2009; Weller 2007; Kerrawalla 2008). Blogging, it is suggested, supports learning (Dickey 2004; Burgess 2006; Farmer 2006), increases reflection (Halic et al. 2010), fosters a sense of community (Halic et al. 2010), enables collaboration (Halic et al. 2010), and promotes constructivist learning (Deed and Edwards 2011; Krause 2004; Kerrawalla et al. 2008).

Other technologies and their collaborative affordances include LinkedIn and Ning, which help to keep track of existing conversations; GoogleDrive and OneDrive for centralised document sharing; Diigo, Delicious (formerly del.icio.us), Scoop.it as collaborative sites for collecting and organising shared information and language; mind mapping for brainstorming or concept building; and cloud computing for collaborative creation of knowledge on the web for future use. Others include web response systems such as Polleverywhere.com, Votapedia, TurningPoint, and Echo LectureTools that allow for a blended collaborative approach to learning.

Digital Technologies for Creating Authentic Learning Experiences

Authentic learning and assessment experiences increase access, flexibility and choice for learners and also increase their participation, retention and achievement (Herrington and Oliver, 2000). Authentic learning multimedia activities that integrate text, images, audio, video and animations can create realistic representations of 'real world' problems and scenarios compared to static print. Multimedia capabilities allow for rich and interactive illustration of otherwise complex concepts or actions in the form of dynamic simulations, experiments and social interactions (Moizer et al. 2009). Also, online simulations and video technologies can support accessibility and flexibility of assessment and support risk-free preparations of real-world skills in professional education. Such examples include flexible simulated environments such as SecondLife (http://secondlife.com/), Active worlds (https://www.activeworlds.com/) and Opensimulator (http://opensimulator.org/) that allow learners to practice skills and try out new ideas in a safe environment.

Gaming can also provide authentic learning experiences with its reinforcing learning capabilities to provide fast feedback, motivate learners by making learning enjoyable, and the potential to maintain engagement of learners on task while mastering complex concepts and understanding the underpinning concepts. Digital gaming technology examples include Learning Light, e-Learning Centre, Games-based Learning (http://www.e-learningcentre.co.uk/eclipse/Resources/games.htm), Twitchspeed (http://www.twitchspeed.com/site/news.html), and Carlton College's Game-based Learning (http://serc.carleton.edu/introgeo/games/index.html).

Digital Technologies for Meeting Different Learning Styles

Mobile technologies such as smartphones, tablets, hand-held portable devices and tiny computers such as netbooks and Ultrabooks offer accessibility, portability and flexibility (see Cochrane and

Bateman 2010). They are ubiquitous and can be selected to suit the personal learning preferences of the learner. The lines of informal, formal and personal learning blur as these mobile technologies become increasingly affordable and accessible around the globe, coupled with faster, accessible and cheaper Internet. The ability to transfer and deliver a range of intensive interactive multimedia via the Internet and received by these high-powered mobile technologies will impact HEIs. This challenges academics to think about their learning resources and teaching styles, and how they are best aligned to suit the learning styles and capabilities of their students. Currently, HEIs are witnessing an exponential growth of their diverse learners. The research reveals an increasing use of mobile devices in HE and that more teachers are using iTouch mobile devices (Mayberry et al. 2012), including iPads, iPods (Dale and Pymm 2009; Olney, Herrington and Verenikina 2009; Mantei and Kervin 2009; Forrest 2009); iPhones (Herrington 2009; Ferry 2009; Hoban 2009), and iPad in Education program of Apple (Apple, http://www.apple.com/au/education/). BYOD programs are popular initiatives in educational institutions around the world.

Digital Technologies for Enhancing Communication and Interaction of Staff-to-Learner/s, and Learner-To-Learner/s

Asynchronous technologies include discussion boards, emails, instant chat, journals and blogs to facilitate immediate contact with other learners and teachers. Synchronous tools allow virtual real-time communication between learners and teachers, and these technologies include VOIP such as Skype, Lync, Google Hangout, Blackboard Collaborate and web video conferencing. These web conferencing tools allow for face-to-face classroom sessions to be offered virtually in real-time, often with features including whiteboard, chat, participant monitoring, recording and breakout rooms for group activities. Learners can participate anywhere, anytime around the world.

Digital Technologies for Personalised Learning

Digital technologies enables learning to be tailored to the learner based on individual learner differences, preferences and learning performance. Educators can adapt their instruction and lesson plans to the learning needs of the students with the use of online self-tests, quizzes and or polling tools. These tools can help educators check the understanding of the learner before moving forward, diagnose initial views or levels of understanding, and survey for opinions or feedback. Similarly, special selective release tools in learning management systems (LMS) (Moodle, Blackboard Learn and Desire2Learn), for example, allow educators to make items such as learning resources available to certain students based on certain criteria or conditional activities, like completion of a prior learning module or score on a quiz, before moving on. This can help students before progressing to the next learning path show mastery or proficiency in the prior learning materials. Further, computerised intelligent tutoring systems can provide a sustainable means of addressing prior knowledge of individuals and provide immediate and customized instruction to learners based on diagnostic feedback of student's learning and accumulated learner data without the need for constant intervention and oversight by the academic. The computational model and algorithms incorporated in such intelligent learning systems rely on learning data accumulated by these systems to help adapt the learning and tailor individual learning pathways for students. In the work of Huang, Huang and Chen (2007), they proposed using a computerised adaptive testing based on a genetic algorithm to develop an adaptive learning path for how learning materials are accessed and displayed for each learner. Furthermore, a cloud-based eLearningsystem, like SmartSparrow

(http://www.smartsparrow.com) allows educators to create rich, interactive and adaptive learning experiences based on learner progress through the accumulated online learner data.

Other technologies that rely on learner data online to provide personalised learning for students include personal learning networks (PLNs). PLNs help learners to make sense of the large quantities of information saturating learners by allowing learners to subscribe and filter the information in order to keep up to date with information that is most relevant to their learning. PLN technologies include Web 2.0 such as Facebook, Twitter, Blogs, Yammer, and RSS feeds which enable learners to subscribe to a network of people around the world to receive aggregated and learner preferred information in a timely manner, suited to their learning preferences.

Digital Technologies for Assessment and Feedback

Using technologies as part of the assessment and feedback process can help to improve the quality of the student experience (Marriott and Lau 2008). By making the experience of assessment more authentic and thus engaging learners can more effectively monitor and assess their own learning, as well as improving the quality and timeliness of feedback (see Liang and Tsa 2010; Lillie 2008). Technologies such as ePortfolios, blogs and online journals support and encourage students to take ownership of their learning by allowing them to self-reflect on their learning, curate, organise, demonstrate and showcase their learning achievements. For the teaching team, technology helps with improving the management of assessment by teaching teams. It does this by improving and streamlining the assessment and transparency of the marking process, as well as enabling teaching teams to track and monitor student progress and grades online.

Digital technologies such as LMSs come with a prolific set of features and tools to help with the assessment process such as allowing educators to create online assignment submission spaces, mark online and offline using a marking rubric tool, and provide assignment feedback easily. There is also extended flexibility in the LMSs to easily assign custom settings to cater for individual students with special consideration and or students with special needs should they require extended time to complete the assignment task. Moreover, software tools such as Turnitin which are typically integrated with LMSs are often used in HEIs in line with assignment submission process to primarily help educate students about plagiarism and collusion. Software technologies that provide student feedback include common applications such as Adobe Acrobat Pro and Microsoft Word for embedding in-built digital annotations and textual highlights, track changes, and inclusion of commentary text boxes. Digital devices such as special pens and touchpads and iPads can help educators interact with illustration software with more precise drawings and annotations on student assignments; and devices such as webcams, audio recording devices and smart phones also have the capability for recording audio and video which can be used to provide an alternative means of assignment feedback.

Digital Technologies for Presenting Learning Resources in Interactive and Engaging Ways

According to Wang et al. (2005) learning courses that use a range of multimedia can promote active learning by using a good mix of multimedia such as video, audio, games, simulations and interactions to maximise its effects on learning (also see Markett et al. 2006). Nowadays, educators have access to a smorgasbord of presentation tools, learning objects and open education resources to help them create visually engaging and professional looking learning materials. Learning objects (LOs) such as MERLOT http://www.merlot.org and Scootle http://www.scootle.com.au have a common set of traits.

They provide easily accessible and re-usable video, audio, graphic, text or interactive learning files that can be integrated into a wide range of learning scenarios and systems. Furthermore, open education resources (OERs[2]) such as TED, Khan Academic, YouTube, and iTunes provide worldwide information rich video resources that are available for educators to supplement their teaching resources. More recently, a range of presentation tools are available to educators that offer alternatives to the traditional PowerPoint and allows users quick and easy access to create visually engaging and professional looking presentations. Common features of these tools include: a suite of in-built layout templates and stock images to choose from (see http://www.haikudeck.com); they are cloud-based, allowing educators to create, edit and deliver their presentations from anywhere around the world using the Internet and usually on a range of devices such as computer, tablet and mobile phones (Prezi http://www.prezi.com); and Powtoon (http://www.powtoon.com) also provides added animation and storytelling capability (Robin 2008). Whilst other tools allow for a range of multimedia to be embedded for creating engaging and visually appealing videos (Animoto http://www.animoto.com) and other tools such as Project (http://www.projeqt.com) weave together other sources such as RSS feeds, Twitter feeds, YouTube, and other media stored on the computer, into a professional looking and sharable video without much technical know-how from the educator.

Clearly, there are a multitude of digital technologies available to educators and learners to enhance student learning and experiences. The digital technologies mentioned here are some that are freely available and easily accessible. They support and facilitate student learning by: catering to different learning preferences; improving communication and collaboration opportunities; enhancing assessment and providing timely feedback; developing more engaged and interactive learning resources; and, ultimately providing an enhanced personalised and authentic learning experience for students (see Cahir et al. 2012; Cochrane 2010; Hargis and Marotta 2011).

[2] For example MIT has example of accounting relayed Open Courseware (MIT 2013)

- Management Accounting and Control
- Financial Accounting
- Financial and Managerial Accounting

Project Outcomes, Findings and Recommendations

We have collected and analysed data from: the literature; our interviews with accounting educators identified as leaders in the use of digital technologies in accounting education; and our in-depth and extended conversations with our 6 exemplar educators to inform our project outcomes, key findings and recommendations presented below.

Project Outcomes

The project revealed clear themes, emergent from the data. These themes are presented in the project's key deliverable, the iResource.

1. There is vast array of innovative digital technologies that can be utilised in teaching to enhance learning outcomes (see Appendix D).
2. Diverse drivers motivate the choice of technology use.
3. The effectiveness of technology as it relates to student learning outcomes is unclear.
4. There are clear key benefits and challenges of technology use in relation to a) teaching and b) assessment.
5. Student evaluations of technology were evident.
6. Definitions of digital technology varied.
7. Levels of academic support provided by faculties and institutions varied.
8. A variety of other issues raised by staff including: accessibility; anonymity; digital generation; funding; large lectures; self-reflective practitioners; staff training/workshops; staff uptake; and time.

The details of the findings are presented in the iResource and comprehensive Findings Report (Appendix A).

Key Findings

The key findings as presented in the iResource and Findings Report (Appendix A) can be summarised as follows:

1. **Engagement with technology.** There is a lack of engagement with technology amongst accounting educators. This appears to stem from a range of reasons including: resistance to change and time/workload.
2. **Thoughtful and appropriate use of technology.** Technology use is clearly important in higher education, but the adoption of technology in T&L must be linked to a clear purpose which considers the specific ways in which technology enhances students learning and outcomes.
3. **Students like technology.** The literature testifies to the demands and expectations that students have in relation to technology use in their learning. Accounting educators need to be mindful of these expectations and where they exist, build on the digital skills students have.
4. **The future is technology.** This study, along with many others, points to the way higher education and T&L has been transformed and continues to be transformed by technology. There is no denying that technology will continue to drive the digital frontier and accounting educators need to embrace the opportunities afforded by technology.

Key Recommendations

1. **Awareness raising amongst academics.** The first recommendation relates to awareness raising amongst academics about the potential of technology and the opportunities it affords in curriculum design. Students expect technology to be used in their learning. It is how they communicate, collaborate, share knowledge and learn. Employers also expect that graduates arrive in the workplace as digitally skilled. Awareness raising requires communicating the potential of technology at every level and the possibilities of its various mediums (i.e. staff blogs and sharing practice). A key to this is providing access for academics to support and guidance using a just-in-time approach.
2. **Understanding the landscape of choices.** In order for staff to engage with technology, they need to be made aware of the many options available to them and their uses.
3. **Making the appropriate choice.** This relates to best practice in relation to T&L and assessment. Technology use, we propose, must be thoughtful, intentional and specifically aligned to student learning outcomes.
4. **Implementation.** In order for staff to engage with and adopt technology use in their teaching practice, a range of factors need to be systematised. These include: support for staff, capacity building, sustainability, engagement with a broad range of people (subject team), and stability of the system.
5. **Evaluation.** The importance of a strong evaluation framework to rigorously assess the impact of technology use on student learning outcomes.

Integrating current digital technologies in accounting education is an ongoing opportunity and challenge. As facilitators of learning, academics need to be aware of the breadth of digital technologies available that provide diverse ways of engaging with a generation of learners that are always connecting, clicking and communicating.

Our research has revealed that the uptake of technology across accounting education in Australia is ad hoc and reliant on individual champions in an individual unit/course. While this may be viewed by some as a precursor to wider adoption, we contend that there is no time to waste and that a thoughtful and course/program based strategy is needed. The strategy to embed appropriate technologies to enhance student learning outcomes in accounting education must be aligned to the provision of academic support using a Just-In-Time (JIT) approach. Further, there needs to be room for risk-taking as we develop our understanding of how technologies are best used to enhance student learning.

The importance of using technologies to support underlying pedagogy cannot be underestimated. Constructively aligned curriculum and learner centred design and delivery improves the learning opportunities for students. Good teachers improve the opportunity for better learning. Technology is not a panacea for quality learning and should be used only where it improves student engagement and learning. However, the evidence is clear that engaged students is the key to improved learning, and technology is an opportunity for improving engagement with our students – be they in a classroom on campus between 9am and 9pm, in front of a computer in Namibia, or sitting at their kitchen table at 2am.

Dissemination

Our approach to the development and dissemination of the project resources aimed to promote and support change in accounting education in relation to innovative digital technology use in teaching and learning. The dissemination strategy will be concentrated in the October 2014 – December 2014 period when the Final Report and iResource are completed and ready for distribution.

A project launch is planned for November 2014 in Melbourne.

Planned Articles

Watty, K., McKay, J. and Ngo, L. (2014). National study into innovative digital technologies in teaching, learning and assessment in accounting education. *Accounting Education.*

Watty, K., McKay, J. and Ngo, L. (2014). Innovative digital technologies in Accounting Education: A National Study. *In the Black*, CPA Australia, Melbourne.

Reports

Watty, K., McKay, J. and Ngo, L. (2014). *Innovative teaching, learning and assessment in accounting education: Engaging with digital technologies that enhance student learning*. Final Report. CPA Australia/Deakin University: Melbourne.

iResource

Available at the following website for download: http://www.deakin.edu.au/buslaw/aef/research/iresource/index.php

Please note that the iResource will be loaded with a news item narrative after the launch on November 17, 2014

Forthcoming dissemination activities

DATE	ACTIVITY/EVENT/CONFERENCE		PURPOSE	NUMBER OF HEIs	NUMBER OF PEOPLE
October 2014	Every Accounting HoS in Australia to be sent the iResource and a promotional email to be forwarded to their staff.		To promote the project across the broader accounting education community.	39	100+
November 2014	CPA/Deakin University Project Launch, Melbourne Australia		To disseminate the Final Report, the iResource to the accounting education community.		
November 2014	The iResource is to be promoted in the Deakin Learning Futures eNewsletter.		To promote the project across the entire university.	1	1000+

November 2014	The iResource to be added to the Deakin University, Learning Innovations blog.		To promote the project across the faculty.	1	300+
2015	AFAANZ conference (Australia)		To promote the project across the broader accounting education community at a national level.	Many and varied	500+ est
2015	EAA conference (Scotland)		To promote the project across the broader accounting education community at an international level.	Many and varied	800+ est
2015	ASCILITE conference		To promote the project across the broader higher education community, nationally.	Many and varied	200+

References

Ahmed, A. (2003). The level of IT/IS skills in accounting programmes in British universities. Management Research News, 26(12), 20.

Ai-Lim Lee, E., Wong, K.W., & Fung, C.C. (2010). How does desktop virtual reality enhance learning outcomes? A structural equation modelling approach. Computers & Education, 55(4), 1424-1442.

Albrecht, W.S., & Sack, R.J. (2000). Accounting Education: Charting the course through a perilous future. Accounting Education Series, 16.

Aldamen, H. & Duncan, K. (2013), Engagement via web-based quizzes and exam performance in a blended learning intermediate accounting course. Paper presented at the *36th Annual Congress European Accounting Association Doctoral Colloquium,* EAA, May*,* Paris, France.

Allen, I.E., & Seaman, J. (2007). *Online Nation: Five Years of Growth in Online Learning*. Sloan Consortium, Newburyport, MA.

Apostolou, B., Blue, M.A. & Daigle, R.J. (2009). Student perceptions about computerized testing in introductory managerial accounting. Journal of Accounting Education*,* 27(2), 59-70.

Apostolou, B., Hassell, J.M., Rabele, J. & Watson, S.F. (2011). Accounting education literature review (2006-2009)'. Journal of Accounting Education*,* 28(3-4), 145-197.

Apostolou, B., Dorminey, J.W., Hassell, J.M., & Watson, S.F. (2013). Accounting education literature review (2010–2012). Journal of Accounting Education, 31(2), 107-161.

Arbaugh, J., Godfrey, M., Johnson, M., Pollack, B., Niendorf, B. & Wresch, W. (2009). Research in online and blended learning in the business disciplines: key findings and possible future directions. Internet and Higher Education, 12, 71-87.

Arnold, N. & Paulus, T. (2010). Using a social networking site for experiential learning: Appropriating, lurking, modeling and community building. The Internet and Higher Education, 13(4), 188-196.

Arquero, J.L., & Romero-Frias, E. (2013). Using social network sites in Higher Education: an experience in business studies. Innovations in Education and Teaching International, 50(3), 238-249.

Augustsson, G. (2010). Web 2.0, pedagogical support for reflexive and emotional social interaction among Swedish students. The Internet and Higher Education*,* 13(4), 197–205.

Austrade (2012). More than MOOCS: opportunities arising from disruptive technologies in education. Australian Trade Commission, Canberra, 1-34.

Barber, M., Donnelly, K. & Rizvi, S. (2013). An avalanche is coming: higher education and the revolution ahead. Institute for Public Policy Research, March, London.

Barr, N., & Crawford, I. (1998). Funding higher education in an age of expansion. Education Economics, 6(1), 45-70.

Barrett, L., & Barrett, P. (2007). Current practice in the allocation of academic workloads. Higher Education Quarterly, 61(4), 461-478.

Barrington, E. (2004). Teaching to student diversity in higher education: how Multiple Intelligence Theory can help. Teaching in Higher Education, 9(4), 421-434.

Bates, A. T. (2005). *Technology, e-learning and distance education*. Routledge.

Bawaneh, S.S. (2011). Does using computer technology improve students' performance! Evidence from a management accounting course. International Journal of Business and Social Science, 2(10), 266-274.

Baxter, R.J., & Thibodeau, J.C. (2011). Does the use of intelligent learning and assessment software enhance the acquisition of financial accounting knowledge? Issues in Accounting Education, 26(4), 647-656.

Bennett, S., Maton, K., & Kervin, L. (2008). The 'digital natives' debate: A critical review of the evidence. British Journal of Educational Technology, 39(5), 775-786.

Bernard, R.M., Abrami, P.C., Lou, Y., Borokhovski, E., Wade, A., Wozney, L. & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. Review of Educational Research, 74(3), 379-439.

BCA (2011). *Lifting the Quality of teaching and learning in higher education*, BCA.

Beaghan, J.P. (2011). Distance learning in accounting courses from the student's perspective (1999-2006). Journal of College Teaching & Learning (TLC), 4(12).

Berry, J. (2009). Technology support in nursing education: Clickers in the classroom. Nursing Education Perspectives, 30(5), 295-298.

Biktimirov, E.N., & Klassen, K.J. (2008). Relationship between use of online support materials and student performance in an introductory finance course. Journal of Education for Business, 83(3), 153-158.

Blount, Y. & McNeill, M. (2011). Fostering independent learning and engagement for postgraduate students: Using a publisher-supplied software program. International Journal of Educational Management,25(4), 390-404.

Bokor, J. (2012). University of the Future: a thousand year old industry on the cusp of profound change. Ernst & Young, Australia, 1-32.

Bozok, M.S. (2011). The effects of distance education materials on the traditional accounting course. Turkish Online Journal of Distance Education (TOJDE), 12(2), article 14.

Broad, M., Matthews, M. & McDonald, A. (2004). Accounting education through an online-supported virtual learning environment. Active Learning in Higher Education, 5(2), 135.

Browne, T., Hewitt, R., Jenkins, M., & Walker, R. (2008). 2008 Survey of Technology Enhanced Learning for higher education in the UK. UCISA. Available at: http://static-71-166-250-129.washdc.east.verizon.net/eLibrary/ARCHIVES/GENERAL/UCISA_UK/U080902B.pdf.

Bryant, S., Kahle, J. & Schafer, B. (2005). Distance education: a review of the contemporary literature. Issues in Accounting Education, 20(3), 255-272.

Cahir, J., Huber, E., Handal, B., Dutch, J. & Nixon, M. (2012). Study-MATE using text messaging to support student transition to university study. Youth Studies Australia, 3(1), 34-42.

Calk, R., Alt, K., Mills, S.K. & Oliver, R. (2007). The effective delivery of a streaming video course lecture. Accounting Education: An International Journal, 16(1), 81-93.

Campus Technology (2012). Technology transforming education: 4 real-world models of success. Rosetta Stone, December, Chatsworth, CA.

Carmichael, P. & Burchmore, H. (2010). Social software and academic practice: Postgraduate students as co-designers of Web 2.0 tools. The Internet and Higher Education, 13(4), 233-241.

Carnaghan, C. & Webb, A. (2007). Investigating the effects of group response systems on student satisfaction, learning, and engagement in accounting education. Issues in Accounting Education, 22(3), 391-410.

Carnaghan, C., Edmonds, T. P., Lechner, T. A., & Olds, P. R. (2011). Using student response systems in the accounting classroom: Strengths, strategies and limitations. Journal of Accounting Education, 29(4), 265–283

Chang, C.J., & Hwang. N.C. R. (2003). Accounting education, firm training and information technology: A research note. Accounting Education, 12(4), 441.

Chen, C.C., Jones, K.T. & Moreland, K. (2010). Distance Education in a Cost Accounting Course: Instruction, Interaction, and Multiple Measures of Learning Outcomes. The Journal of Educators Online, 7(2), 1-21.

Chen, C. & Jones, K. (2007). Blended learning vs. traditional classroom settings: assessing effectiveness and student perceptions in an MBA accounting course. The Journal of Educators Online, 4(1), 1-15.

Chui, L., Martin, K., & Pike, B. (2013). A quasi-experimental assessment of interactive student response systems on student confidence, effort, and course performance. Journal of Accounting Education, 31(1), 17-30.

Clegg, S. (2003). Learning and teaching policies in higher education: mediations and contradictions of practice, British Educational Research Journal, 29(6), 803-819.

Coaldrake, P., & Stedman, L. (2013). Raising the stakes. Paper presented at *Beyond the comfort zone*, 21st ASCILITE Conference, Perth.

Conole, G., & Alevizou, P. (2010). A literature review of the use of Web 2.0 tools in Higher Education. A report commissioned by the Higher Education Academy.

Conole, G., De Laat, M., Dillon, T., & Darby, J. (2008). 'Disruptive technologies', 'pedagogical innovation': What's new? Findings from an in-depth study of students' use and perception of technology. Computers & Education, 50(2), 511-524.

Coates, H., Dobson, I., Friedman, T., Goedegebuure, L. & Meek, L. (2009), *The Attractiveness of the Australian Academic Profession: A comparative analysis*, LH Martin Institute, Melbourne.

Cochrane, T. (2010). Exploring Mobile Learning success factors. ALT-J, Research in Learning Technology, 18(2), 133-148.

Cochrane, T., & Bateman, R. (2010). Smartphones give you wings: Pedagogical affordances of mobile web 2.0. Australasian Journal of Educational Technology, 26(1), 1-14.

Cunningham, S., Ryan, Y., Stedman, L., Tapsall, S., Bagdon, K., Flew, T. & Coaldrake, P. (2000). *The business of borderless education,* DETYA, Canberra.

Cooper, H., Robinson, J. C., & Patall, E. A. (2006). Does homework improve academic achievement? A synthesis of research, 1987–2003. Review of educational research, 76(1), 1-62.

Coursera. (2013). Couresra. URL: http://coursera.org

Dale, C. & Pymm, J.M. (2009). Pedagogy: the ipad as a learning technology in higher education. Active Learning in Higher Education, 10(1), 71-83.

Dahlstrom, E. & diFilipo, S. (2013), *The Consumerization of Technology and the Bring-Your-Own-Everything (BYOE) Era of Higher Education*, ECAR Research Report, Louisville, Colo.: EDUCAUSE Center for Applied Research.

Dearing, R. (1997). The National Committee of Inquiry into Higher Education. A summary report.

Deed, C. & Edwards, A. (2011). Unrestricted student blogging: implications for active learning in a virtual text-based environment. Active Learning in Higher Education, 12(1), 11-21.

DEECD 2014, *Teaching with Digital Technologies*, Department of Education and Early Childhood Development. Available at: <http://www.education.vic.gov.au/school/teachers/support/pages/elearningcurriculum.aspx >

Dillard-Eggers, J., Wooten, T., Childs, B., & Coker, J. (2011). Evidence on the effectiveness of on-line homework. College Teaching Methods & Styles Journal (CTMS), 4(5), 9-16.

Dobbins, K. (2009). Feeding innovation with learning lunches: contextualising academic innovation in higher education. Journal of Further and Higher Education, 33(4), 411-422.

Dodd, T. (2013). Employers 'wary of wholly online study'. *ARF*, 8 April, http://www.afr.com/p/national/education/employers_wary_of_wholly_online_cZFz3x0fB3kNVcfiWWq1QL.

Duncan, K., Kenworthy, A., & McNamara, R. (2012). The effect of synchronous and asynchronous participation on students' performance in online accounting courses. Accounting Education: An International Journal, 21(4), 431–449.

Edmonds, C. T., & Edmonds, T. P. (2008). An empirical investigation of the effects of SRS Technology on introductory managerial accounting students. Issues in Accounting Education, 23(3), 421–434.

EdX. (2013). EdX. UR: https://www.edx.org/

Ellett, J. (2010). Thought leadership: Building a culture of collaboration. http://www.nfusion.com/article/thought-leadership-building-a-culture-of-collaboration.

Ernst & Young 2013, *University of the Future: A thousand year old industry on the cusp of profound change*, Ernst & Young.

Evans, C 2008, 'The effectiveness of m-learning in the form of podcast revision lectures in higher education', *Computers & education*, vol. 50, no. 2, pp. 491-498.

Evans, E., Burritt, R. and Guthrie, J. (2013). The Virtual University: Impact on Australian accounting and business education. ICAA: New South Wales.

Fessler, N. (Producer). (2008, Fall) *Cost Accounting* [Audio podcast]. Retrieved from http://itunes.apple.com

Fessler, N.J. (2012). YouTube, iTunes U and you. Accounting Education: An International Journal, 21(1), 43–45.

Freeman, M. & Bell, C. (2010). Learning and teaching academic standards project: learning and teaching academic standards statement for accounting. Australian Learning and Teaching Council (ALTC), December.

Friedman, M., Rushinek, A. & Rushinek, S. (2006). The effect on achievement of using emerging technology in the managerial accounting course. The Accounting Educators' Journal*,* 16, 25-40.

Friedrich, R., Le Merle, M. Peterson, M. & Koster, A. (2010). The rise of Generation C: implications for the world of 2020', *Booz & Co*, 1-20. Available at: http://www.booz.com/global/home/what-we-think/reports-white-papers/article-display/rise-generation-implications-world-2020.

Gaffney, M. A., Ryan, D., & Wurst, C. (2010). Do online homework systems improve student performance? Advances in Accounting Education, 11, 49–68

Gagne, M. & Shepherd, M. (2001). Distance learning in accounting. *T.H.E. Journal*, 28(9), 58-65.

Geng, G. (2012). Investigating the use of text messages in mobile learning. Active Learning in Higher Education, 14(1), 77-87.

Goldwater, P.M. & Fogarty, T.J. (2007). Protecting the solution: A 'high-tech' method to guarantee individual effort in accounting classes. Accounting Education: An International Journal*,* 16(2), 129-143.

Gosper, M., Green, D., McNeill, M., Phillips, R., Preston, G. & Woo, K. (2008). *The impact of web-based lecture technologies on current and future practices in learning and teaching*, ALTC, Sydney.

Grabinski, K., Krasodomska, J. & Kędzior, M. (2013). The use of e-learning in the teaching of accounting – the case of Poland. Paper presented at the *36th Annual Congress European Accounting Association Doctoral Colloquium,* EAA, May*,* Paris, France.

Grimley, M., Green, R., Nilsen, T., Thompson, D. & Tomes, R. (2011). Using computer games for instruction: the student experience. Active Learning in Higher Education, 12(1), 45-56.

Grosseck, G. (2009). To use or not to use web 2.0 in higher education? Procedia-Social and Behavioral Sciences, 1(1), 478-482.

Hagner, P.R., & Schneebeck, C.A. (2001). Engaging the faculty. Technology Enhanced Teaching and Learning: Leading and Supporting the Transformation on Your Campus: Jossey-Bass.

Hahn, W., Fairchild, C., & Dowis, W. B. (2013). Online Homework Managers and Intelligent Tutoring Systems: A Study of Their Impact on Student Learning in the Introductory Financial Accounting Classroom. Issues in Accounting Education, 28(3), 513-535.

Halabi, A.K., & De Lange, P. (2011). The usefulness and interactions of WebCT from an accounting student's perspective. Advances in Accounting Education, 12, 77–95.

Halic, O., Lee, D., Paulus, T. & Spence, M. (2010). To blog or not to blog: Student perceptions of blog effectiveness for learning in a college-level course. The Internet and Higher Education, 13(4), 206-213.

Hannan, A. (2005). Innovating in higher education: contexts for change in learning technology. British Journal of Educational Technology, 36(6), 975-985.

Hargis, J. & Marotta, S.M. (2011). Using flip camcorders for active classroom metacognitive reflection. Active Learning in Higher Education, 12(1), 35-44.

Hemmi, A., Bayne, S. & Land, R. (2009). The appropriation and repurposing of social technology. Journal of Computer Assisted Learning, 25(1), 19-30.

Herrington, J., and Oliver, R. (2000). An instructional design framework for authentic learning environments. Educational Technology Research and Development, 48(3), 23-48.

Hiralaal, A. (2012). Students' experiences of blended learning in accounting education at the Durban University of Technology. South African Journal of Higher Education, 26(2), 316-328.

Holtzblatt, M., & Tschakert, N. (2011). Expanding your accounting classroom with digital video technology. Journal of Accounting Education, 29(2–3), 100–121.

Hornik, S., & Thornburg, S. (2010). Really engaging accounting: Second Life™ as a learning platform. Issues in Accounting Education, 25(3), 361-378.

Huang, M., Huang, H. and Chen, M. (2007). Constructing a personalized e-learning system based on genetic algorithm and case-based reasoning approach. International Journal of Expert Systems with Applications, 33(3), 551-564.

Huang, W.H.D., Hood, D.W. & Joo Yoo, S. (2013). Gender divide and acceptance of collaborative Web 2.0 applications for learning in higher education. The Internet and Higher Education, 16, 57-65.

Hughes, J. A. (2011). Supporting the Online Learner. In T. Anderson (ed.), *Theory and Practice of Online Learning*, 2nd Ed. (pp. 419 – 440).

Huh, S., Jin, J., Lee, K., & Yoo, S. (2010). Differential effects of student characteristics on performance: online vis-a-vis offline accounting courses. Academy of Educational Leadership Journal, 14(4), 81-89.

International Federation of Accountants (IFAC). (2007). Information technology for professional accountants.

Iverson, K., Colky, D. & Cyboran, V. (2005). E-learning takes the lead: an empirical investigation of learner differences in online and classroom delivery. Performance Improvement Quarterly, 18(4), 5-18.

James, R., Krause, K.L. & Jennings, C. (2010). *The first year experience in Australian universities: findings from 1994-2009*. Available at: http://www.griffith.edu.au/gihe/staff/klkrause-publications/FYE_Report_1994_to_2009-opt.pdf

Jebeile, S. H., & Abeysekera, I. (2010). The spread of ICT innovation in accounting education. Available at: http://ro.uow.edu.au/cgi/viewcontent.cgi?article=4254&context=commpapers.

Jennings, J. (2006). Accountancy toes the online approach, *The Age*, May 6, 2.

Johnson, S. D., & Aragon, S. R. (2003). An instructional strategy framework for online learning environments. New directions for adult and continuing education, 2003(100), 31-43.

Jones, K. (2008). Blended learning in a graduate accounting course: student satisfaction and course design issues. The Accounting Educators' Journal, 18, 15-28.

Jones, G., & Abraham, A. (2007). Educational implications of the changing role of accountants Perceptions of practitioners, academics and students, In *The Quantitative analysis of teaching and learning in business, economics and commerce*, Forum proceedings, The University of Melbourne, 9 February 2007, 89-105. Available at: http://ro.uow.edu.au/commpapers/296.

Jones, K. T., & Chen, C. C. (2008). Blended-learning in a graduate accounting course: Student satisfaction and course design issues. The Accounting Educators' Journal, 18.

Jones, K., Moeeni, F. & Ruby, P. (2005). Comparing web-based content delivery and instructor-led learning in a telecommunications course. Journal of Information Systems Education, 16(3), 265-271.

Jones, S. H., & Wright, M. E. (2010). The effects of a hypertext learning aid and cognitive style on performance in advanced financial accounting. Issues in Accounting Education, 25(1), 35–58.

Kang, I., Bonk, C.J., Kim, M. (2011). A case study of blog-based learning in Korea: technology becomes pedagogy. The Internet and Higher Education, 14, 227-235.

Kassens-Noor, E. (2012). Twitter as a teaching practice to enhance active and informal learning in HE: the case of sustainable tweets. Active Learning in Higher Education, 13(1), 9-21.

Kearn, K., Woodthorpe, J., Robertson, S. & Hutchison, M. (2010). From forums to wikis: Perspectives on tools for collaboration. Internet and Higher Education, 13(4), 218-225.

Kember, D., McNaught, C., Chong, F. C., Lam, P., & Cheng, K. F. (2010). Understanding the ways in which design features of educational websites impact upon student learning outcomes in blended learning environments. Computers & Education, 55(3), 1183-1192.

Kenny, J., & McNaught, C. (2000). Promoting quality outcomes in higher education using new learning technologies: Processes and plans at RMIT. Learning to choose. Choosing to learn, 655-664.

Kennedy, G.E., Judd, T.S., Churchward, A., Gray, K., & Krause, K. (2008). First year students' experiences with technology: Are they really digital natives. Australasian Journal of Educational Technology, 1, 108-122.

Kennedy, G. (2009). Educating the Net Generation: a handbook of findings for practice and policy. University of Melbourne, Melbourne. Available at: <http://www.netgen.unimelb.edu.au/outcomes/handbook.html>.

Kerawalla, L., Minocha, S., Kirkup, G. & Canole, G. (2009). An empirically grounded framework to guide blogging in higher education. Australasian Journal of Educational Technology, 1, pp. 31-40.

Kerawalla, L., Minocha, S., Kirkup, G. & Canole, G. (2008). Characterising the different blogging behaviours of students on an online distance learning course. Learning, Media and Technology, 33(1), 21-33.

Khanlarian, C., Shough, E., & Singh, R. (2010). Student perceptions of web-based homework software: A longitudinal examination. Advances in Accounting Education, 11, 197–220.

Kirkwood, A., & Price, L. (2005). Learners and learning in the twenty-first century: what do we know about students' attitudes towards and experiences of information and communication technologies that will help us design courses? Studies in Higher Education, 30(3), 257-274.

Koh, J.H.L., Herring, S.C. & Hew, K.F. (2010). Project-based learning and student knowledge construction during asynchronous online discussion. Internet and Higher Education, 13(4), 284-291.

Kohlmeyer, J. M., Seese, L. P., & Sincich, T. (2011). Online versus traditional accounting degrees: Perceptions of public accounting professionals. Advances in Accounting Education, 12, 139-165.

Krause S. (2004). When Blogging Goes Bad: A Cautionary Tale About Blogs, Email Lists, Discussion, and Interaction (1). K A I R O S, 9(1). Available at: http://english.ttu.edu/kairos/9.1/binder.html?praxis/krause/index.html.

Krause, T. (2009). Facilitating teamwork with lean six stigma and web-based technology. Business Communications Quarterly, March, 84-90.

Kuh, G. D., & Hu, S. (2001). The relationships between computer and information technology use, selected learning and personal development outcomes, and other college experiences. Journal of College Student Development, 42(3), 217-232.

Kuh, G. D., & Vesper, N. (2001). Do computers enhance or detract from student learning? Research in Higher Education, 42(1), 87-102.

Land, R. (2011). Speed and the Unsettling of Knowledge in the Digital University. In *Digital Difference* (61-70). SensePublishers.

Larres, P.M., & Radcliffe, G.W. (2000). Computer-based instruction in a professionally-accredited undergraduate tax course. Accounting Education, 9(3), 243.

Liang, J.C. & Tsa, C.C. (2010). Learning through science writing via online peer assessment in a college biology course. The Internet and Higher Education, 13(4), 242-247.

Lillie, R.E. (2008). Using a technology-mediated approach to create a practice-feedback-interaction process for use with accounting courses. Advances in Accounting Education, 9, 267-286.

Lin, Z. J., Xiong, X. & Liu, M. (2005). Knowledge base and skill development in accounting education: Evidence from China. Journal of Accounting Education, 23(3), 149.

Lindquist, T. M., & Olsen, L. M. (2007). How much help, is too much help? An experimental investigation of the use of check figures and completed solutions in teaching intermediate accounting. Journal of accounting education, 25(3), 103-117.

Lopes, A.I., Capelo, C. & Mata, A. (2013). The use of computer simulations in management accounting classes: an experiment in teaching the balance scorecard. Paper presented at the *36th Annual Congress European Accounting Association Doctoral Colloquium,* EAA, May, Paris, France.

Love, N. & Fry, N. (2006). Accounting students' perceptions of a virtual learning environment: Springboard or safety net? Accounting Education: An International Journal, 15(2), 151-166.

Lusher, A.L., Huber, M.M., & Valencia, J.M. (2012). Empirical evidence regarding the relationship between the computerized classroom and student performance in introductory accounting. The Accounting Educators' Journal, 22, 1–23.

MacGregor, K. (2013), March 16, A higher education avalanche is coming, says new report, *University World News,* no. 263. Available at: www.universityworldnews.com/article.php?story=20130316093956321

Magnier-Watanabe, R., Benton, C., Herrig, H. & Aba, O. (2011). Blended learning in MBA education: a cross-cultural experiment. Open Learning: The Journal of Open, Distance and e-Learning, 26(3), 253-263.

Malloch M. (2005). E-learning 2.0. Available at: http://www.knownet.com/writing/elearning2.0 (accessed 2006).

Mantei, J., & Kervin, L. (2009). Using iPods to capture professional dialogue between early career teachers to enrich reflective practice.

Margaryan, A., Littlejohn, A., & Vojt, G. (2011). Are digital natives a myth or reality? University students' use of digital technologies. Computers & Education, 56(2), 429-440.

Markett, C.I., Arnedillo, S., Weber, S. & Tangney, B. (2006). Using short message service to encourage interactivity in the classroom. Computers and Education, 46(3), 280-293.

Marriott, N. (1992). The effectives of using spreadsheets to teach financial accounting. Accounting Education, 1(2), 137.

Marriott, P. (2009). Students' evaluation of the use of online summative assessment on an undergraduate financial accounting module. British Journal of Educational Technology, 40(2), 237–254.

Marriott, P. & Lau, A. (2008). The use of on-line summative assessment in an undergraduate financial accounting course. Journal of Accounting Education, 26(2), 73-90.

Marriott, P., & Teoh, L. K. (2012). Using screencasts to enhance assessment feedback: Students' perceptions and preferences. Accounting Education: An International Journal, 21(6), 583–598.

Mason, R. & Rennie, F. (2008). *e-Learning and social networking handbook: resources for Higher Education*, Routledge, New York.

McDowall, T. & Jackling, B. (2006). The impact of computer-assisted learning on academic grades: An assessment of students' perceptions. Accounting Education: An International Journal*,* 15(4), 377-389.

McGarr, O. (2009). A review of podcasting in higher education: Its influence on the traditional lecture. Australasian Journal of Educational Technology, 25(3), 309-321.

McVay, G.J., Murphy, P.R. & Yoon, S.W. (2008). Good practices in accounting education: Classroom configuration and technological tools for enhancing the learning environment. Accounting Education: An International Journal*,* 17(1), 41-64.

Millson, M. & Wilemon, D. (2008). Technology enabling innovation in online graduate management education. International Journal of Innovation and Technology Management, 5(4), 401-421.

MIT. (2013). *MIT Open Courseware*. URL: http://ocw.mit.edu/courses/index.htm

Moizer, J., Lean, J., Towler, M. & Abbey, C. (2009). Simulations and games: overcoming barriers to their use in higher education. Active Learning in Higher Education, 10(3), 207-224.

Moura, A. & Carvalho, A.A. (2010). Mobile learning: using SMS in educational contexts. Key Competencies in the Knowledge Society: IFIP Advances in Information and Communication Technology, 324, 281-291.

NMC (2012). NMC Horizon Project short list: 2013 Higher Education edition. The New Media Consortium, Austin, Texas.

NMC (2014). NMC Horizon Report: 2014 Higher Education edition. The New Media Consortium, Austin: Texas.

Norton, A., Sonneman, J., & McGannon, C. (2013). The online evolution: when technology meets tradition in higher education. Grattan Institute, Australia. Available at: http://grattan.edu.au/publications/reports/post/the-online-evolution-when-technology-meets-tradition-in-higher-education/.

Olney, I.W., Herrington, J., & Verenikina, I. (2009). Digital story telling using iPods. Faculty of Education-Papers, 79.

Paewai, S. R., Meyer, L. H., & Houston, D. J. (2007). Problem Solving Academic Workloads Management: A University Response1. Higher Education Quarterly, 61(3), 375-390.

Pepicello, W. (2012). University of Phoenix. In Oblinger, D.G. (ed), *Game Changers: Education and Information Technologies*, Educause, pp. 133-144.

Perera, L., & Richardson, P. (2010). Students' use of online academic resources within a course web site and its relationship with their course performance: An exploratory study. Accounting Education: An International Journal, 19 (6), 587–600.

Perreault, H., Waldman, L., Alexander, M. & Zhao, J. (2008). Graduate business students' perceptions of online learning: a five year comparison. The Delta Pi Epsilon Journal, 3, 164-180.

Phillips, F., & Johnson, B. G. (2011). Online homework versus intelligent tutoring systems: Pedagogical support for transaction analysis and recording. Issues in Accounting Education, 26(1), 87–97.

Phillips, F., & Sheehan, N. T. (2013). Modeling Accounting Workplace Interactions with Text-to-Video Animation. Accounting Perspectives, 12(1), 75-87.

Ponzurick, T.G., France, K. & Logar, C.M. (2001). Delivering graduate marketing education: an analysis of face-to-face versus distance education. Journal of Marketing Education, 22(3), 180-187.

Porter, A. & Sherwin, M. (2013). The Digital Campus: The online future for higher education. Precedent, UK.

Potter, B.N. & Johnston, C.G. (2006). The effect of interactive on-line learning systems on student learning outcomes in accounting. Journal of Accounting Education, 24(1), 16-34.

Premuroso, R.F., Tong, L., & Beed, T.K. (2011). Does using clickers in the classroom matter to student performance and satisfaction when taking the introductory financial accounting course? Issues in Accounting Education, 26(4), 701-723.

Prensky, M. (2001). Digital natives, digital immigrants, part I. On the Horizon, 9(5).

Prensky, M. (2013). Twitchspeed, URL: http://www.twitchspeed.com/site/news.html.

Priluck, R. (2004). Web-assisted courses for business educations: an examination of two sections of principle of marketing. Journal of Marketing Education, 26(2), 161-173.

Prinsloo, P., Müller, H., & Du Plessis, A. (2010). Raising awareness of the risk of failure in first-year accounting students. Accounting Education: an international journal, 19(1-2), 203-218.

Prosser, M. (2000). Evaluating the new technologies: A student learning focused perspective. Uniserve Science May Workshop. Unpublished.

Quality Assurance Agency for Higher Education (QAA). (2000). Subject benchmarking statement – Accounting, Quality Assurance Agency for Higher Education.

Rich, A.J., & Dereshiwsky, M.I. (2011). Assessing the comparative effectiveness of teaching undergraduate intermediate accounting in the online classroom format. Journal of College Teaching & Learning (TLC), 8(9), 19-28.

Richardson, P., Dellaportas, S., Perera, L. and Richardson, B. (2013). Students' perceptions on using iPods in accounting education: a mobile-learning experience. Asian Review of Accounting, 21(1), 4-26.

Robin, B.R. (2008). Digital storytelling: A powerful technology tool for the 21st century classroom. Theory into Practice, 47(3), 220-228.

Robinson, C.C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. Journal of Education for Business, 84(2), 101-109.

Roblyer, M.D., McDaniel, M., Webb, M., Herman, J., & Witty, J.V. (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. The Internet and Higher Education, 13(3), 134-140.

Rosen, E. (2008). *The culture of collaboration*. San Francisco: CA: Red Ape Publishing,

Co.Rumble, G. (2001). The costs and costing of networked learning. JLAN, 5(2).

Salleh, A. (2000). The role of computer in the enhancement of accounting education. Unpublished Dissertation (PHD (Accounting)), University of East Anglia.

Salmon, G. (2005). Flying not flapping: a strategic framework for e-learning and pedagogical innovation in higher education institutions. Research in Learning Technology, 13(3).

Sangster, A. (1995). World Wide Web – what can it does for education? Active Learning, 2, 3.

Sangster, A., & Mulligan, C. (1997). Integrating the World Wide Web into an accounting system course. Accounting Education, 6(1), 53.

Sargent, C.S., Borthick, A.F., & Lederberg, A.R. (2011). Improving retention for principles of accounting students: Ultra-short online tutorials for motivating effort and improving performance. Issues in Accounting Education, 26(4), 657–679.

Schneckenberg, D. (2009). Understanding the real barriers to technology-enhanced innovation in higher education. Educational Research, 51(4), 411-424.

Schulmeister, R. (2014). Is there a net gener in the house? Dispelling a mystification. Learning, 2014, 01-24.

Sellani, R. & Harrington, W. (2002). Addressing administer/faculty conflict in an academic online environment. The Internet and Higher Education, 5(2), 131-145.

Selwyn, N. (2009, July). The digital native–myth and reality. In ASLIB Proceedings (61(4), 364-379). Emerald Group Publishing Limited.

Senik, R., & Broad, M. (2011). Information technology skills development for accounting graduates: intervening conditions. International Education Studies, 4(2), p105.

Sitzmann, T., Kraiger, K., Stewart, D., & Wisher, R. (2006). The comparative effectiveness of web-based and classroom instruction: A meta-analysis. Personnel Psychology, 59(3), 623-664.

Shepard, M.F. (2012). Creating a Culture of Digital Collaborative in Online Learning, The Next Generation of Distance Education, Springer, 127-138.

Smith, C.M. & Sodano, T.M. (2011). Integrating lecture capture as a teaching strategy to improve student presentation skills through self-assessment. Active Learning in Higher Education, 12(3), 151-162.

Spangehl, S.D. and Hoffman, A. 2012 (Eds.). *Innovations in Higher Education: Igniting the Spark for Success*. Lanham, MD: Rowman & Littlefield Publishers.

Sugahara, S. & Boland, G. (2006). The effectiveness of PowerPoint presentations in the accounting classroom. Accounting Education: An International Journal, 15(4), 391-403.

Sydner, I., Marginson, S. & Lewis, T. (2007). "An alignment of the planets": mapping the intersections between pedagogy, technology and management in Australian universities. Journal of Higher Education Policy and Management, 29(2), 187-202.

Tamim, R.M., Bernard, R.M., Borokhovski, E., Abrami, P.C., & Schmid, R.F. (2011). What forty years of research says about the impact of technology on learning a second-order meta-analysis and validation study. Review of Educational Research, 81(1), 4-28.

Terry, N., Owens, J. & Macy, A. (2001). Student performance in the virtual versus traditional classroom. Journal of the Academy of Business Education, 2(1), 1-4.

Theuri, P.M., Greer, B.M., & Turner, L.D. (2011). The efficacies of utilizing a multimedia based instructional supplement on learners' cognitive skills. The Accounting Educators' Journal, 21, 107–129.

Thornton, P. & Houser, C. (2004). Using mobile phones in education. *The 2nd IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE '04)*, IEEE Computer Society, Vaxjo, Sweden.

Toohey, S. 1999. *Designing courses for higher education*, Philadelphia, PN, SHRHE & Open University Press.

Trentin, G. (2009). Using a wiki to evaluate individual contribution to a collaborative learning project. Journal of Computer Assisted Learning, 25(1), 43-55.

Turney, C.S.M., Robinson, D., Lee, M., & Soutar, A. (2009). Using technology to direct learning in higher education the way forward? Active Learning in Higher Education, 10(1), 71-83.

Tynan, B., Ryan, Y., & Lamont-Mills, A. (2013). Examining workload models in online and blended teaching. British Journal of Educational Technology.

Tynan, B., Ryan, Y., Hinton, L., & Lamont Mills, A. (2012). *Out of hours: Final Report of the project e-Teaching leadership: planning and implementing a benefits-oriented costs model for technology enhanced learning*. *Australian Learning & Teaching Council (ALTC)*, Sydney.

Vamosi, A., Pierce, B.G. & Slotkin, M.H. (2004). Distance learning in an accounting principles course-student satisfaction and perceptions of efficacy. Journal of Education for Business*,* 79(6), 360-366.

Wang, J.A., Yetsko, K., Licitra, J. & Armstrong, T. (2005). *Encouraging active learning through multimedia and interactive courseware*. Proceedings of 35th ASEE/ IEEE Frontiers in Education Conference.

Warburton, S. (2009). Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. British Journal of Educational Technology, 40(3), 414-426.

Wasson, B. & Vold, V. (2012). Leveraging new media skills in a peer feedback tool. The Internet and Higher Education, 15, 255-264.

Weil, S., McGuigan, N. & Kern, T. (2011). The usage of an online Discussion forum for the facilitation of case-based learning in an intermediate accounting course: a New Zealand case. Open Learning: The Journal of Open, Distance and e-Learning, 26(30), 237-251.

Weller, M. (2006). VLE 2.0 and future directions in learning environments. First LAMS Conference, Sydney, December 2006. Retrieved August 2007 from http://lamsfoundation.org/lams2006/pdfs/Weller_Lams06.pdf.

Wells, P., de Lang, P. & Fieger, P. (2008). Integrating a virtual learning environment into a second-year accounting course: Determinants of overall student perception. Accounting and Finance, 48(3), 503-518.

Whitton, N. (2009). *Learning with digital games: A practical guide to engaging students in higher education,* Routledge.

Wong, L. (2012). Student attitudes towards e-learning: the first year accounting experience. Issues in Informing Science and Information Technology, 9, 195-207.

CPA Global Research Program

DATA ANALYSIS – FINDINGS

31 January, 2014

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1. Drivers of technology use

Respondents were asked to indicate what they identified as the key drivers in their technology use. Their responses are tabulated below. The results indicate that more than half of respondents (54%) identified student engagement as the key driver of technology use. The second most commonly cited driver was that technology enabled greater efficiency of time use both in and out of the classroom. The third most frequently identified driver was the need to ensure students are workplace-ready.

Drivers of technology use	**Respondents**	**Illustrative quotes**
Makes the unit/content more *interesting* for students	RS_001	*..having taught accounting for 20 years, introductory accounting for 20 years, I've almost grasped what the concepts are. And so anything that makes the subject different, more interesting and so on, you know, there's just so many ways you can teach it. [RS_001]* *So for me, innovation was a way of trying to make the subject more interesting for me and more interesting for my students. [RS_001]*
Student engagement	RS_001, RS_002, RS_004, RS_005, RS_008, RS_009 RS_013	*So it enables the communication and engagement that's not otherwise available, because the face to face method has died out ... [RS_004]* *So it's not a case of getting with basic skills, it's about trying to make…really tedious subjects like company accounting interesting. [RS_004]* *…the traditional learning methodology is not particularly engaging our students. So I see digital technology and electronic methodology as ways to engage. [RS_009]*
Student participation	RS_001, RS_002 RS_005	*So we've got to get that level of participation…that level of interest. [RS_001]* *I think it enables participation a lot more than what physical teaching does, at least for my international students..[RS_002]*
Personalised learning	RS_003, RS_008	*I guess it's a more personalised approach to student learning. They get their questions answered more specifically, more tailored to what they are and have difficulty in. So, to me, it's effective in that sense rather than this be in a lecture hall and students felt as if they're part of a mass rather than an individual. I guess that's always been my thing to try and personalise learning as much as possible with the help of technology. [RS_003]* *technology enables you to do a lot of things that you weren't able to do previously and the thing that they were not able to do previously would be the personalised approach which I think technology's able to do that. [RS_003]*

Helps students grasp complex concepts	RS_001, RS_003, RS_010	*..when you see that your students are really not grasping something, you just really want to do something to help them understand it and that's the impetus, the designing something, is when you see students struggling, you know, year after year in the same class and you think, "I need to something about this", you know. So I think that's the impetus. [RS_010]*
Makes the unit/content more interesting to teach	RS_001	*So for me, innovation was a way of trying to make the subject more interesting for me and more interesting for my students. [RS_001]*
Just something the teacher felt they had to do	RS_002, RS_009	*I don't know whether I needed a prompt or whether the prompt was physically there, it was just something I knew I had to do.. [RS_002]*
Time can be used more productively by using the technologies; efficiency	RS_003, RS_006, RS_007, RS_011, RS_012	*..an efficient mechanism for dealing with increasing student numbers and increasing numbers of sessional tutors. [RS_012]* *That's the big reason why I do it now…it makes my life easier. [RS_011]* *I mean, it took some development time to get it rolling but once it's up, I think it's saved us a lot of time.. [RS_007]* *Effective for me I think in terms of how much I can communicate to students in a minimal amount of time… now, as I'm going about my life, I integrate my teaching responsibilities in with having breakfast, or sitting on the train reading the newspaper. [RS_006]*
Supports the flip classroom, extends the classroom	RS_003, RS_011	*I believe that it would support the flip classroom approach. That's why I brought in the technology.. [RS_003]* *Well, the intent is that…students will learn the content outside of class, and as much as we used to ask them to do when they would the read textbook, our delivering it in an electronic format and that when they come to class, I can do more interactive exercises, I can do team based projects, I can have them work with their partner, we can do longer case studies and I can just cover more content than I could before I started using technology. [RS_011]*
Personal interest in technology	RS_004, RS_006, RS_013	*Well I was a techie from a very young age, so what can I say…I got my first computer when I was about four, so yeah. [RS_013]* *I started in academia in my early twenties, and I'm now in my mid-thirties, and so innovation and technology has always been something I use in my personal life. [RS_006]*

To improve communication	RS_004, RS_006	*..always looking…to develop ways to improve …communication. [RS_004]* *Effective for me I think in terms of how much I can communicate to students. [RS_006]*
To ensure students are able to harness and use technology, and feel comfortable doing so	RS_004, RS_005	*So I suppose we're trying to encourage…accounting students to see that technology and data isn't going to go away. They either have to cope with it and know how to deal with it or they're going to struggle as accountants out in the workplace [RS_005]* *..working with them to be able to harness technology, to get them more effective in their use of time. [RS_004]*
To improve students' quality of work	RS_004	*..to improve the quality of the work. [RS_004]*
Because students want it	RS_005	*I do it because I think students are wanting it. They're wanting us to use more technology because they feel that they use more technology in their day to day to lives so why aren't we sort of thing. [RS_005]*
To make things easier for students	RS_005	*But also just to try and make things easier for students…[RS_005]*
To move with the times and innovate	RS_005, RS_007	*..for them to feel like we were actually moving with the times and doing new things with the technology. [RS_005]* *…there is an onus on us to keep up to date. Everyone in the profession…they keep up to date with these things. [RS_007]*
To ensure students are ready and prepared for the workplace; equipped with IT skills	RS_005, RS_007, RS_009, RS_010	*As soon as they walk out the door they are expected to be able to deal with technology every day and it's about us preparing them better. [RS_005]* *..adopting technology as an important part of what students need for career knowledge and skills when they leave here. As a generic skill. [RS_005]*
Allows teachers to integrate their everyday lives with teaching (i.e. can be tweeting/facebooking while on the train and thus teaching 24/7)	RS_006	*And now, as I'm going about my life, I integrate my teaching responsibilities in with having breakfast, or sitting on the train reading the newspaper. [RS_006]*
Ensures students feel they have 24/7 access to teachers and learning	RS_007, RS_011	*From their point of view, it meant they had us in a way on-call all the time. [RS_007]* *I continue to use that technology in the classroom, even in my traditional classroom formats, because it allows me to extend the classroom so that students can get content outside of the classroom so it doesn't limit the amount of classroom time that I have with them so that they can get a lot more content hours, the contact hours*

		for the content, where they can watch the videos on-line anytime they want to. They can have access to me… That's the big reason why I do it now and it makes my life easier. [RS_011]
Helps international students in terms of accessibility (replaying lectures at their own pace)	RS_007	*It was useful for them, especially for non-English speaking students - who we obviously have quite a number of - that they could replay things at their own leisure. [RS_007]*
Technology grants students anonymity	RS_012	*…students can become anonymous when asking questions etc. [RS_012]*

2. Definitions of digital technology

The following section lists some of the definitions that interviewees provided when asked how they define digital technology:

> *I'm actually not quite sure how to define it because I think everything's merged and where the boundary lines are is becoming increasingly blurred. [RS_004]*
>
> *I define digital technology as anything that uses the Internet to communicate between myself and the student. So that could be a website, it could be Facebook, it could be Twitter, it could be email, anything along those lines. [RS_006]*
>
> *I suppose it's anything moving away from just your standard paper-based sort of text book and face-to-face methods. So whether it be eBooks, whether it be multimedia, social media, learning management systems, anything like that. [RS_007]*
>
> *..it's just really any medium that can be used to enhance student learning. [RS_009]*
>
> *..digital technology is technology that is used in the classroom and that helps the students to learn better and also helps the instructor to instruct better. [RS_011]*

3. Impact on accounting education

Interviewees were asked to identify what they viewed as the impact of technology on accounting education. This is particularly important considering that accounting as a discipline is often slow to adopt innovative digital technologies, as some of our respondents indicated:

> *The accounting academic population is aging and that's not even in relation to an issue just with technology…you've got staff that have been there for a while and say, "Look, I don't really want to have to learn this or learn something different," which is fair enough. [RS_007]*
>
> *We have not really seen much in accounting yet but they are there for the game … academics wishing to invest the time and money (and be prepared to be distracted from producing research papers which is likely to be a non-traditional provider like Pearsons) [RS_012]*

Their responses in relation to the impact technology stands to have on accounting education are recorded below.

Impact on accounting education	Respondents	Illustrative quotes
Accessibility of information to all students	RS_001	*First is the access to information. [RS_001]*
How accounting academics are designing courses	RS_002	*I think in general it has massive implications for any type of education … I mean I can't, for example, get students to my lectures physically anymore, and I think that has a massive implication for accounting education in terms of how we're designing our courses. [RS_002]*
Student engagement	RS_002, RS_004, RS_008, RS_009	*So it's not a case of getting with basic skills, it's about trying to make particularly really tedious subjects like company accounting interesting. [RS_004]* *…it enhances the experience of an accounting student and gets them to interact and engage, so definitely improves engagement outside the classroom. [RS_008]*
Changing the way complex information is delivered	RS_002, RS_005, RS_012	*I would say it's revolutionary, for accounting at least. [RS_002]*
Personalised learning	RS_003	*I think it has a really important impact in terms of communicating with students in a manner that they're familiar with, and that they use frequently. [RS_006]*
Learning is made more enjoyable	RS_003	*I think to me that's how I think. Not so much the way forward but how can I use this idea to make learning more enjoyable, more relevant to students? That's always been my thinking I suppose. [RS_003]*
Creating graduates who are workplace ready; IT skills are now wanted by accounting firms	RS_004, RS_005, RS_010	*…we meet with the partners of the firms and the senior people in the public service…one of the things they're pushing is for what they call IT skills. [RS_004]*
24/7 teaching and learning	RS_007	*I think one way is certainly the perception of students, I suppose the level of support they, I suppose what they expect from us. It's almost a 24/7 thing that's happening now. That if they've got a question at whatever time of the day, in terms of the online boards and some of those aspects, they expect us to be able to get back to them. [RS_007]*
Changing teaching practice	RS_007, RS_009 RS_011	*…it means that in the face to face environment, I can be reinforcing rather than, for want of a better word, instructing. [RS_009]* *I can do more interactive exercises, I can do team based projects, I can have them work with their partner, we can do longer case studies and I can just cover more content than I could before I started using technology. [RS_011]*
Better caters to diverse cohorts	RS_009	*…given the type of student cohort that is now coming through universities, I think we have to think of better ways*

		to enhance learning, and I think electronic methodology is a way to do that. [RS_009] *…technology can be a bridge… I do believe that technology can sort of make that bridge between my attempt to explain a particular concept, I think I can use technology to augment that. [RS_009]*
Extending learning beyond the walls of the classroom	RS_013	*Potential is to provide a classroom away from any located position, basically. So that's the ultimate outcome. So learning in the cloud. [RS_013]*

Respondents were in agreement about the overall importance of technology to accounting education in the future. As the following interviewees commented:

> *I think it makes a big difference. I think that especially with all of the changes that we're seeing here in the United States with the decrease in the number of traditional classroom based formats that schools are wanting to offer with the increase and on-line learning or hybrid learning, I think we're going to see digital technology just grow to be more and more important. [RS_011]*
>
> *…given the direction that we're going and the MOOCS that are coming out – I think that digital technology…Three aspects of it – hardware, software and the integration of the two – they will form a significant backbone in future accounting education. [RS_013]*

4. Types of digital technologies

The following table details the types of digital technologies and quantifies the number of respondents who use the specific digital technologies.

Types of digital technologies	**Respondents**
Moodle	RS_004, RS_010, RS_002
Clickers (Interact)	RS_001
Lecture note delivery	RS_004
Flipped classroom	RS_003
Recording of lectures	RS_004, RS_005
Tablet notes	RS_004
Tablet computer (not an iPad)	RS_011
iPad technology	RS_005, RS_006, RS_001
iPhone, Smart phones	RS_001, RS_002, RS_005, RS_013
PowerPoint	RS_001, RS_004, RS_010, RS_013, RS_003
Dropbox	RS_004
Scoop It	RS_004

Intelligent Tutoring systems	RS_002
Developing Apps	RS_005
GoogleDocs	RS_003
Screen Captures	RS_011
Screen Tasks	RS_001
SASS? SAS?	RS_005
Internet Evidence Finder (forensics tool)	RS_005
Online tutorial processes	RS_005
Quiz technology/online quizzes	RS_005, RS_008
Online assessment/paperless assessment	RS_005
Collaborate (virtual lectures)	RS_005
Illuminate	RS_005
SAS Enterprise Guide	RS_005
GoSoapBox (instant response tool)	RS_005
Blogs	RS_005
Wikis	RS_005
Twitter	RS_005, RS_006, RS_007, RS_004
Spark, Spark Plus	RS_001, RS_005, RS_006, RS_012
Praise	RS_005
Blackboard, (aka Tracks)	RS_005, RS_006, RS_008, RS_010, RS_011
Podcasts	RS_005, RS_003
eBooks	RS_005
Gamification	RS_012
Voice recognition software	RS_012
Jing	RS_001
e-tax software	RS_005
Facebook	RS_006, RS_004
YouTube (short teaching videos)	RS_001, RS_006, RS_013
Review	RS_006, RS_008
LMS	RS_007

Lecture slides	RS_007
Discussion boards	RS_007, RS_008, RS_012
Multimedia learning objects (short videos) (short case studies)	RS_007, RS_009, RS_011
Narrated Powerpoints	RS_007
Interactive questions	RS_008
Turnitin	RS_008, RS_005
Camtasia	RS_009, RS_011, RS_013
Echo360	RS_009, RS_005
Captivate	RS_009
Exie??	RS_009
Quiz games i.e. hangman	RS_009
SCAM	RS_010
Finesse	RS_010
Poll Everywhere (polling software system)	RS_011
Online homework systems (Accounting Lab, Signage Now)	RS_011
Net Present Value	RS_002
The Normalised Game	RS_002
Pointers	RS_012
Digital markers	RS_013
E-live	RS_013
Cloud technologies	RS_013, RS_004
Prezi (presentation software)	RS_013

5. Simple, practical or innovative?

Respondent	Simple	Practical	Innovative
RS_001			■
RS_002	■		■
RS_003	■	■	
RS_004			■
RS_005			■
RS_006	■	■	
RS_007		■	
RS_008			■
RS_009		■	
RS_010			■
RS_011		■	
RS_012	■	■	■
RS_013	■	■	■

6. What makes technology use effective?

Participants were asked to identify what made their use of technology 'effective'. The table below provides a breakdown of their responses.

Effective technology use	Respondents
Perfecting the technology, ensuring the technology works	RS_005
Staff capacity in technology use	RS_005, RS_007, RS_001, RS_008, RS_009, RS_013
Student capacity in technology use	RS_001, RS_002, RS_003, RS_004, RS_009
Utilises the devices that students already have in their pockets	RS_001, RS_009
Making the videos real and appealing to students	RS_006, RS_007
Giving the technology the time it requires	RS_007
Targeted to learning outcomes/student learning	RS_007, RS_010

Only use what staff are comfortable with	RS_007
Has to be up to date/current/relevant	RS_007
Monitor and self-reflect on the use of technology	RS_008
Isn't too onerous or time consuming	RS_008
Caters to students	RS_009, rS_002, RS_003, RS_004, RS_005, RS_006, RS_007, RS_008, RS_010
Is engaging and appeals to students	RS_011, RS_013
Accessibility (24/7)	RS_011
Doesn't have to be perfect	RS_011
Pedagogy and purpose of the technological innovation is explained to students	RS_003, RS_007
Promotes active learning	RS_003

7. Key benefits of technology

Participants in our study were asked to identify what they saw as the 3 key benefits of technology in terms of 1) teaching and 2) assessment.

OVERALL BENEFITS OF TECHNOLOGY

Some interviewees spoke to the overall benefits of technology firstly and identified the following:

Benefits of technology	**Respondents**
Access to information – egalitarian nature of information	RS_001
Information can be accessed *where you are* and *at a time that suits you*	RS_001, RS_007, RS_009
Personalised approach to learning	RS_003
Saves time/more efficient	RS_007, RS_009
24/7 access to learning/staff	RS_007
Helps and supports students from diverse backgrounds	RS_007

BENEFITS OF TECHNOLOGY IN TEACHING

Benefits of technology – teaching	**Respondents**
Anonymity/safe environment for students	RS_001, RS_002, RS_012
Helps in large lectures	RS_001

Better engages students	RS_002, RS_004, RS_007, RS_012
Helps create a community	RS_002
Accessibility	RS_002
Flexibility	RS_002, RS_005, RS_012
Helps diverse student cohorts	RS_003, RS_006, RS_007, RS_009, RS_011, RS_012, RS_013
Personalised approach to learning	RS_003, RS_008
24/7 access to learning/support/staff	RS_004, RS_006, RS_007, rS_010
Instant feedback	RS_004, RS_012
Can cater to a range of learning styles	RS_004, RS_013
Faster delivery of information	RS_005, RS_006
More efficient for staff, eases staff workload	RS_005, RS_006, RS_013
Can better map learning objectives, and cater to learning outcomes	RS_011, RS_012
Demonstrates a university is moving forward	RS_005
Enables teachers to integrate their everyday life with teaching	RS_006
Helps explain complex concepts	RS_007
Improves student/teacher communication	RS_007, RS_013
Helps in the revision process (easily rewind and replay)	RS_009, RS_012
Helps bring real life examples into the classroom	RS_010
Prepares students for the accounting profession	RS_010
Enables data analytics (relating to information about students who are logging on, completing tasks, struggling etc.)	RS_011

BENEFITS OF TECHNOLOGY IN ASSESSMENT

Benefits of technology – assessment	**Respondents**
Enables teachers to assess in more creative ways	RS_001
Can better capture evidence of student learning	RS_002
Instant feedback	RS_004, RS_006
More efficient than traditional assessment	RS_005, RS_008

24/7 access for students	RS_008
Student flexibility	RS_008
It can be structured to capture the topics	RS_008
Is good for group work	RS_008, RS_012
Ensures greater transparency	RS_008
Can better monitor learning outcomes	RS_011

8. Key challenges of technology

Participants in our study were asked to identify what they saw as the 3 key challenges of technology in terms of 1) teaching and 2) assessment.

8.1. Overall challenges of technology

Challenges of technology	**Respondents**
Lack of staff uptake	RS_001, RS_007
Encourages students to be on their phones	RS_001
It might not be accessible to all	RS_001
Not always user-friendly	RS_001
Can be expensive	RS_001
Staff workload	RS_007
Research versus teaching	RS_007

8.2. Challenges of technology – teaching

Challenges of technology – teaching	**Respondents**
Encourages students to be on their phones/facebook in class time	RS_001
Student capacity is not always there	RS_001, RS_009
There are dangerous assumptions about student capacity and comfortability with technology	RS_001, RS_004
Staff uptake, staff engagement	RS_002, RS_006, RS_012
Issues with the technology itself	RS_003, rS_006, RS_011,
Lack of support from the university	RS_003, RS_006, RS_012
Costs of technology	RS_003, RS_012

The need for support from IT	RS_003
Students may not engage with or use the technology	RS_005, RS_008
Harder on diverse students	RS_005
Makes student collusion easier	RS_005, RS_007
Does not suit ALL students	RS_005, RS_007
Connected generation versus older lecturers	RS_006
Students now have expectations of 24/7 teaching/support	RS_007
Takes a lot of TIME/development time vs. benefits	RS_007, RS_011, RS_012
Workload models don't support innovation, lack of rewards	RS_007, rS_012
Lack of face-to-face	RS_007
Not great for soft skill development	RS_009
Overwhelming amount of data	RS_011
Too many different technology options to choose from	RS_012
Technology is quickly out of date	RS_012, rS_013
Need to have appropriate systems in place to support the technology	RS_012
Need to have teams rather than individual champions	RS_012
Excess use of technology, students being bombarded	RS_013
Staff capacity is not always there	RS_013

8.3. Challenges of technology – assessment

Challenges of technology – assessment	**Respondents**
Authentication	RS_001, RS_004, RS_005, RS_007, RS_011, RS_013
Cheating is easier	RS_001
Collusion	RS_008
Some students don't like to collaborate online	RS_002
Higher order thinking is difficult to assess online	RS_004
Students don't always engage with online tasks	RS_005, RS_011
Issues with use-ability of the technology	RS_006
Need to have facilities to be able to support the technology	RS_006

Doesn't always work	RS_009
Takes a lot of time to develop	RS_009
Can be counterproductive if not designed and used properly in assessment	RS_013, RS_012
The need to really think things through	RS_013

9. Technology and learning outcomes

The table below details the common themes that emerged from the question about whether respondents measured learning outcomes and how they went about doing so.

9.1. Measuring learning outcomes

The findings reveal that the most common responses in relation to learning outcomes were:

1. Student surveys and feedback are most often used to measure LO.
2. Measuring LO in relation to the innovative technologies is difficult and challenging.
3. The second most frequently used measure is student participation/feedback.
4. Equal second, self-reflection and reflective journals are used to measure LO.

Learning outcomes	**Respondents**
The challenges of measuring learning outcomes (different cohort of students every year [RS_001]; difficult to measure using marks [RS_001] [RS_006])	RS_001, RS_006, RS_007
It's not like traditional teaching	RS_001
Using students surveys/feedback to measure LO	RS_001, RS_002, RS_003, RS_005, RS_007, RS_009
Level of student participation/student uptake as a measure	RS_001, RS_007, RS_010
The normalized game	RS_002
Critical discussion/discussion forums	RS_002
Student reflection/reflective journal	RS_002, RS_003, RS_004
Presentation/group work	RS_003
Peer evaluation of written assignment	RS_003
Online tests	RS_004
Written work	RS_006
Exam performance	RS_008
Anecdotal evidence from students	RS_011
No evidence of LO	RS_009, RS_011

Illustrative quotes

> *So we survey students and we go, "Did you like it? Did it work? Did it help?" and so we rely, to a certain extent, on those sorts of things. The level of participation, general feedback, focus groups and what students thought about it and so on with it. [RS_001]*

> *I ask for reflective journal pieces on what they have learned or what they haven't learned and why they think it's been a failure, why it's been a failure. [RS_004]*

> *Fundamentally the students do an online evaluation at the end of semester…I get a good feedback about that in terms of qualitative stuff yeah. [RS_009]*

> *I definitely haven't done any data driven studies on whether students learn better with the use of technology. [RS_011]*

> *It's a hard one. How do you measure qualitative learning? It's very difficult. [RS_014]*

9.2. Major themes in student evaluations

The following table provides the breakdown of the major themes that emerged from students' evaluations in relation to the innovative technologies being introduced and used in accounting education.

Major themes in student evaluations	**Respondents**
Students like using their own devices	RS_001, RS_009
The technologies are relevant	RS_002
They learn from other teams	RS_002
They think it is "great"; really positive and more units should do it	RS_004, RS_006
They talk about technical skills rather than the technology	RS_004
They prefer f-2-f/struggle with technology	RS_005
The technology can be difficult for international students	RS_005
Videos help with learning - ability to rewind and re-watch, short bursts of information	RS_005, RS_011, RS_013
Gen Y – tech savvy and predisposed to technology	RS_006
Technology as a motivational tool	RS_008
Technology problems are inconvenient	RS_008
More engaging	RS_009, RS_013
24/7 learning, flexibility	RS_010, RS_012
Real life examples	RS_010
Immediacy of technology/Instant feedback	RS_011, RS_012

Illustrative quotes:

> *They tend to say that they like using their mobile phones. [RS_001]*
>
> *..it is to do with the fact that they are using a piece of technology that they use. [RS_001]*
>
> *Any time, any place. So these are all internet based so that is definitely an advantage, they can login and use it from any location and at any time as long as they have internet access. [RS_002]*
>
> *Yeah. They've said relevance; they talk about relevance, yeah. [RS_002]*
>
> *They're just saying they can't cope with it going online. They just can't learn that way. They find that learning approach difficult for them and so they just want to go back and do it the traditional way I suppose. [RS_005]*
>
> *..we get a lot of feedback through our student feedback surveys, in the free response section, where students say, oh look I really found that the videos were helpful, because it's not just a written word on a page, I could watch the video and watch you draw and listen. [RS_005]*
>
> *And it's summarised. It's short. It's a burst of presentations as opposed to where I cover six weeks of lectures in two to three hours, but in a very summarised form… They engage and they ask questions. [RS_013]*

10. Levels of support

Interviewees were predominantly supported in their use of technology, whether by the Faculty or institution, or both. Only one respondent had none, while three respondents had limited support. Six respondents (46 per cent) had Faculty support only, one respondent had support from both Faculty and Institution, and two respondents had institutional support only.

Respondents	**Support from Faculty/Institution/None/Limited**
RS_001	Faculty
RS_002	Faculty
RS_003	Faculty
RS_004	Faculty
RS_005	Faculty and Institutional
RS_006	None
RS_007	Faculty
RS_008	Faculty
RS_009	Limited
RS_010	Institutional
RS_011	Institutional
RS_012	Limited
RS_013	Limited

As well as being early adopters, the qualitative data reveals that all of the respondents (100%) in our interviews were individual champions of digital technology use in their schools and institutions. Illustrative quotes include:

> *I've been the pioneer. [RS_001]*

> *I remember I ran into my Dean as I came back from the very first day when I saw it and I said, "I think I've seen the future of education". [RS_001]*

> *I don't know whether I needed a prompt or whether the prompt was physically there, it was just something I knew I had to do, if that makes sense. [RS_002]*

11. Hypothetical – with unlimited funds….

Some interesting results emerged from the question asking participants what they would do if they hypothetically had unlimited funds. Many of the respondents indicated that they would not actually spend the money on technology – but rather, on improving and increasing face-to-face contact with students. The below tables details these responses:

What they would do with unlimited funds	**Respondents**
Improve face-to-face contact/overall contact with students	RS_001, RS_007, RS_012
Educate staff, professional development	RS_002, RS_009, RS_012
Change all lecture based classes into flipped classrooms	RS_002
Hire technology professionals	RS_002
Increase the production values on video	RS_004
Artificial intelligence	RS_007
Enhance tailored adaptive learning	RS_008
Develop a lot more tools/materials/resources	RS_008, RS_004, RS_013
Develop accounting simulation	RS_008
Applying a corporate model of online education to higher education	RS_009
Enhance industry-education connection, bring in more experts from industry	RS_009,
More videos	RS_009
Develop case studies	RS_010
Intelligent design technology	RS_011
Develop a course that is practical and relevant using the right technologies	RS_013

> *Unfortunately, it wouldn't be technology. It would be to do with access face-to-face. [RS_001]*

I would use the money to contact students. So a human being to ring the student and go "How's it going. Do you need any help with anything" and so on. [RS_001]

I think the biggest thing would be to educate staff. If you use those funds to somehow spend time with staff to educate then I think that would be kind of a self-fulfilling prophecy I would hope. [RS_002]

Well I would use the money to change all the lecture based classes into seminar style [RS_002]

..probably what I like that I see that's coming down the pipeline is this intelligent design technology. The idea that as student can start on a question or homework and then the technology is smart enough to realise that the student doesn't know what they're doing [RS_011]

I think I would spend lots more of the money on the people aspects of getting change than on the technology. [RS_012]

12. Other issues raised

Throughout the interviews, a number of other issues were frequently raised by respondents. These related to:

- staff uptake (11/13 respondents)
- time (8/13 respondents)
- the digital generation (6/13 respondents)
- funding (6/13 respondents)
- self-reflective practitioners (6/13 respondents)
- accessibility (3/13 respondents)
- anonymity (3/13 respondents)
- large lectures (3/13 respondents)

12.1. Staff uptake

Staff uptake was the most frequently raised issue with 11/13 respondents commenting on it. Notably, respondents pointed to the difficulty in getting staff engaged. They also spoke about staff not having time, being resistant to different things and just an overall lack of interest as the major barriers to staff engagement. A breakdown of the major themes which appeared are provided in the table below:

Staff uptake of innovative technologies in AE	**Respondents**
Slow to be picked up in some areas, negativity towards new approaches	RS_001, RS_003
Extra work – another administrative thing staff would have to do	RS_001
Lack of interest	RS_002, RS_006, RS_013
Staff engagement is the biggest barrier, a lot of "pushing uphill"	RS_002, RS_006, rS_009, RS_012
Resistance to "different" things	RS_002, RS_005, rS_008
The importance of educating staff/training sessions/workshops to get staff on board	RS_002
Staff don't think about the bigger picture – they are too technical based	RS_002

Staff just don't have time	RS_002, RS_007, RS_009
They feel a loss of control using new technologies	RS_003
Luddites	RS_004
Technology doesn't work for everybody	RS_006
It's a generational thing	RS_006,
Resistance to learning something new	RS_007
Lack of technology skills	RS_009
Lack of resources	RS_009
Lack of trust in new/fad technologies	RS_012
Lack of rewards	RS_012

Their comments included:

> *Staff engagement, other staff engagement, that's the biggest barrier. [RS_002]*
>
> *Just coming back to what are the barriers in terms of – I just constantly hear, "I don't have time," and I think maybe financial resources aren't necessarily what's required, at least at the department level, or at least to transition those financial resources into time. [RS_002]*
>
> *I think sometimes my work colleagues are too negative. Whenever they see new approaches instead of seeing the possibilities they always see the limitations. I don't know whether it's the training in accounting. [RS_003]*
>
> *I've got colleagues in my department who are absolute luddites who have trouble finding the on off switch. [RS_004]*
>
> *I've got some colleagues who are still back in a talk and chalk type mentality, [RS_004]*
>
> *I find that even within the staff. Some people find it very easy to teach and use technologies, others just don't want to adopt it at all. [RS_005]*
>
> *I still think it's a lot of pushing up hill.. [RS_006]*
>
> *I encounter more resistance from staff that I ever do in terms of embracing the technology. [RS_008]*

12.2. Time

One factor that appeared frequently in the interviews was the issue of time. Staff spoke about the time it takes to develop or learn new technologies. They also referred to the time pressures they are already under and how this serves as a significant barrier to technology adoption. The major themes are provided in the below table.

Time	**Respondents**
Staff just don't have the time	RS_002

Expectations of staff are just too high to be master researchers and master educators	RS_002
Developing technology takes time	RS_006, RS_007; RS_009, RS_010, rS_013
Work out of hours	RS_006, rS_010
Student expectations about teacher's time, 24/7 access to teachers	RS_006, rS_007
Doesn't take too much time to adopt innovative technologies	RS_008, RS_011
It is worth the time and effort	RS_010

Illustrative quotes pertaining to the issue of time are provided below:

> *I just constantly hear, "I don't have time," …[RS_002]*
>
> *I think expectations are very high, too high in terms of what's required, in terms of, you know, across the board, what's expected, I think, of academics is in a way too high, to be master educators, to be master researchers, and masters of administration. I'm just not sure that's a sustainable model for the future. [RS_002]*
>
> *I think it does take a lot of development time getting these things right. Initially a five minute video would take me five hours from start to finish [RS_007]*
>
> *..it is a lot of development time to do it [RS_007]*
>
> *..it's time, the key impediment is time … So if somehow the time could be cut down, that's what's impeding my progress the time, I haven't got enough time to develop as much as what I want to. [RS_009]*
>
> *I don't need much help, just time. …That's it. I don't need too much resources. It's just that I just need time. [RS_013]*

12.3. Digital generation

Six respondents spoke about the issue of generational differences and how they play out in relation to technology. While some viewed the so-called digital divide as a myth, others indicated there are distinct differences between the generations. The following table fleshes out these themes:

Digital generation – digital divide	**Respondents**
The digital generation is a myth (their skills are not as good as often assumed)	RS_004, RS_009, RS_013
Staff need to try and keep up with the digital generation	RS_005, RS_007
Younger people have a greater enthusiasm for technology, they are predisposed to it	RS_006, RS_007

Some illustrative quotes include:

> *..this idea of this new digitally literate generation is a myth. Yeah there is some that are great and some of them as bad as my generation, there's an entire range of skill levels out there and willingness to become familiar with it. It is improving a bit but it's still not universal, so this myth of a digital native, well as I said it's a myth, a bit of a battle rage out there [RS_004]*

But also just to try and make things easier for students I suppose and for them to feel like we were actually moving with the times and doing new things with the technology. [RS_005]

…and we see younger people come in, but there's been more technology used in our more junior staff, they definitely have a greater enthusiasm for it. [RS_006]

..they're part of a generation which is just used to these sort of things being available to them and they'll be predisposed to liking these things anyway [RS_007]

…what I see with my students here…but technology skills just don't really seem to be as good as what you think they should be..[RS_009]

It's not the age. Some people are too interested or too focussed on research, for example. They don't care two hoots about teaching. [RS_013]

12.4. Funding

Funding	**Respondents**
Staff need funding in order to do this	RS_001, rS_010
Funding isn't the issue – it's staff uptake	RS_002
It is expensive and a budget challenge	RS_003, RS_005
Reluctance to invest in new "unknown" technologies; money can be spent in better ways	RS_009

It's always a budget challenge to get new software in and being used by students whether at a school or at university level. We've been lucky that we've had a school that's prepared to often take on those costs of moving forward with technology. [RS_005]

Look there is a reluctance I think to invest in technologies…because they just don't know what it can do, they don't understand what it can do. [RS_009]

Yes and there's always a resourcing debate, moneys' best spent in other ways…and there's a lot of free stuff out there that you can use anyway. [RS_009]

12.5. Self-reflective practitioners

Self-reflectivity	**Respondents**
Getting feedback from other staff and students about one's teaching	RS_003, RS_008
Always looking for ways to improve	RS_004
Thinking about/discussing what's working/not working	RS_004, RS_012
Student focus – always thinking what will be most useful for students	RS_007, RS_009
Being clear on pedagogy/thoughtfully using technology in teaching	RS_007

It's always nice to share one's teaching approach with someone else and get their feedback to some extent. [RS_003]

..one is an interest in it myself and always looking for time to develop ways to improve [RS_004]

Just finding the right technology fit…trying to figure out what it is I want to be able to do and then what I can use to achieve that and that's difficult. [RS_007]

..we've got to be prepared to say we're prepared to walk away and say, "Look, that fails, that does not work." [RS_012]

12.6. Anonymity

In relation to anonymity, three respondents spoke about it as a significant benefit of technology, particularly for those from CALD backgrounds. Two respondents were emphatic in stating, "I think the anonymity is extremely important" (RS_001) and "anonymity is a really strong aspect…that technology can provide" (RS_012). Anonymity was said to make students less afraid of being wrong and thus more willing to participate in class. RS_004 spoke about the importance of this to students from diverse backgrounds – particularly international students – who may face language barriers which often prevents them from participating. Illustrative quotes include:

..anonymity is a really strong aspect of that technology can provide. Anonymity can be used in discussion boards allowing students to more honestly a bit there shortcomings and lack of understanding without feeling foolish, which supports them be more prepared to have a go. Anonymity can assist in facilitating more honest feedback from peers in tools like SPARK that can assist students to learn and develop soft skills like teamwork. Anonymity can be used in role-play simulations. [RS_012]

12.7. Accessibility

Accessibility	**Respondents**
The egalitarian nature of information provided by technology	RS_001
Information is so readily available, comes to you	RS_001
Enables learning any time/any place	RS_002
Diverse student cohorts benefit from technology	RS_004

Illustrative quotes include:

First is the access to information….So the internet has brought what I would call the egalitarian nature to information [RS_001]

The ability to get information brought to you rather than you actually having to go out and get information. [RS_001]

Any time, any place. So these are all internet based so that is definitely an advantage, they can login and use it from any location and at any time as long as they have internet access. [RS_002]

12.8. Large lectures

Large lectures were noted by respondents as a 'necessary evil' in higher education. One respondent very aptly commented: '*So, you know, lectures are a necessary evil for efficiency purposes. And anything you can do to make that lecture work better I think it useful' (RS_001)* and furthermore, *'large lectures do work for a whole set of reasons. Students attend them if they get value'* (RS_001).

> *So, you know, lectures are a necessary evil for efficiency purposes. And anything you can do to make that lecture work better I think it useful. And one of the things that we all use with lectures is we recognise it is a large group and therefore we play the crowd and the fact that we bring them together the same as you do in the theatre, be it a picture theatre or a play theatre and so on with it or a sporting event or whatever, you know. There is advantages in having a crowd together and you can make advantages of that crowd. [RS_001]*
>
> *I think it is the ability to return to a system where individual students can talk to you in an extremely large lecture and yet you still get the benefits of the efficient large lecture [RS_001]*
>
> *I mean I can't, for example, get students to my lectures physically anymore [RS_002]*
>
> *I just don't feel, in general, that we engage our students as best we could, and that's because we don't reach them on their level. I mean we're trying to reach at a level that was – they haven't been brought up with. [RS_002]*

Appendix B | Schedule of Interview Questions

Interview Questions

1. How do you define digital technology?
2. How does digital technology impact accounting education?
3. What are the types of digital technologies that you use in your teaching?
4. What prompted you to use technology in your curriculum design?
5. Do you have diversity in your student cohort? And, if so, does technology have a different role in educating these students?
6. When using technologies, what were you trying to achieve in terms of learning outcomes?
7. How do you measure the student learning outcomes of the innovative technologies you use in your practice? (e.g. student evaluations). Can you provide 2-3 themes that have emerged from student evaluations of your use of technologies? If not, how could you envisage measuring the student learning outcomes of the innovative technologies you use in your practice?
8. What level of support was provided when you introduced technology and from where?
9. What makes your use of the technology effective?
10. Would you describe your use of technology in teaching as a) simple; b) practical; or c) innovative? And why?
11. What do you see as the 2-3 major benefits of using innovative digital technologies in your (1) teaching, and (2) assessment?
12. What do you see as the 2-3 major challenges of using innovative digital technologies in your (1) teaching, and (2) assessment?
13. If you had access to unlimited funds how would you use them to innovate your practice using technologies?

Appendix C | Schedule of Project Meetings

Meeting	Date	Agenda Items addressed
Team Meeting 1	22/1/13	• *Project Scope.* Clarified goals, role of team members. • *Literature Review.* Determined parameters and scope. • *Interviews.* Discussed participants, recruitment process, interview questions. • *Ethics.* Established a plan and determined who will lead the ethics application. • *iResource*. Clarified the 'big picture': aims/content, etc.
Team Meeting 2	11/2/13	• *Project Scope.* Reaffirmed overall aim and purpose of study. • *Literature Review.* Status update and determined new resources to be added. • *Interviews.* Refined draft interview questions and discussed potential interviewees. • *Ethics.* Update provided of the progression of the ethic's application. • *iResource.* Continued discussion of content.
Team Meeting 3	3/4/13	• *Literature Review.* First full draft was provided for review. • *Interviews.* Potential interviewees were identified. • *Project Scope.* Established the innovative technologies to be concentrated upon. • *Ethics.* First full draft of ethics application provided to the team for review.
Team Meeting 4	30/5/13	• *Literature Review.* Two team members provided their feedback to the first draft. Determined two more sections were required: 'Learning Outcomes' and 'Innovation'. • *Interviews.* Determined final list of leads to be followed up once ethics approval had come through. • *Ethics.* Team looked over application and finalised, ready for submission.
Team Meeting 5	11/6/13	• *Literature Review.* Team reviewed the draft and specifically the two new sections on 'Learning Outcomes' and 'Innovation'. • *Interviews.* Update provided on interview schedule. • *iResource.* Continued discussion about content and clarifying format. • *Ethics.* Update provided on ethics application which had been submitted.
Team Meeting 6	28/06/13	• *Ethics.* Update provided on ethics application – approval granted. • *Interviews.* Discussed interviewees, recruitment procedure, team availability and scheduling. • *iResource.* Continue refining content and format.
Team Meeting 7	31/7/13	• *Interviews.* Update on the 8 interviews completed to date. Discussed reminder emails. • *iResource.* Determined timelines, clarified content and role of team members. • *Data Analysis.* Discussed the procedure and developed a plan. • *Progress Report.* Team to commence and complete by 31/8/13.
Team Meeting 8	10/10/13	• *Interviews.* Discussion about the 13 completed interviews. Determined plan for data storage, transcription, etc. • *Data Analysis.* Determined and clarified the methodology for data analysis which team members would carry out the analysis.
Team Meeting 9	30/10/13	• *iResource.* Discuss and determine the process moving forward. • *Data analysis.* Provide an update on the analysis of the interview data.
Team Meeting 10	25/11/13	• *Data analysis.* Set deadlines and actionable tasks for the next month. • *iResource.* Discussed the need for a technology specialist to develop the iResource. • *Second Progress Report.* Clarified content and assigned tasks to members of the team.
Team Meeting 11	13/12/13	• *Data analysis.* Discussed the finalisation of the Findings Report and actionable tasks moving forward. • *iResource. Developed plan for moving forward and proposed potential names for specialist to assist in the development of the iResource.*
Team Meeting 12	14/1/14	• *Meeting to determine status and progress moving forward.*

Team Meeting 13	21/1/14	• *Meeting to work through the Findings Report and clarify the final key finding to emerge from the data.*
Team Meeting 14	10/2/14	• *iResource.* Discussion of the iResource and the specifics of what the resource will look like and what format it will be. Final decision made on an eMag.
Team Meeting 15	13/2/14	• *iResource.* A draft iResource was put to the team to discuss and work through. The exemplars that would be featured in the eMag were discussed.
Team Meeting 16	17/2/14	• *iResource.* Meeting with the IT specialist to discuss the development of the eMag.
Team Meeting 17	12/3/14	• *iResource.* Meeting to finalise the content of the eMag and finalise the exemplars. Questions that would be put to exemplars were determined.
Team Meeting 18	20/3/14	• *Video production*. Meeting to establish what would be asked of each exemplar in their video.
Team Meeting 19	26/3/14	• *Project timeline.* Meeting to discuss the project deadlines and agreed dates for deliverables. Establish permissions relating to logo use, attribution, etc. of institutional and CPA logos on iResource.
Team Meeting 20	31/3/14	• *iResource.* Meeting to discuss the latest draft and develop list of edits for the graphic designer.
Team Meeting 21	8/4/14	• *Video production/iResource.* Catch up meeting to cross-check development of iResource and videos with project deadlines.
Team Meeting 22	2/5/14	• *Final Report.* Meeting to discuss the final report structure, content, deadline. Flagged the potential need for an extension to the project.
Team Meeting 23	30/5/14	• *Deliverables.* Review progress on deliverables and develop actionable tasks moving ahead.
Team Meeting 24	25/6/14	• *Video production.* Meeting to discuss the videos produced thus far.
Team Meeting 25	2/7/14	• *Video production.* Meeting with graphic designer to discuss the final cut of the videos.

Appendix D | Types of Technologies

The diagram below details the range of technologies used by the exemplars in our study.