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A framework for investigating blended learning effectiveness

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Abstract

Purpose – The move towards "blended learning", consisting of a combination of online and face-to-face teaching, continues to gain pace in universities around the world. It is important, however, to question the quality of this learning. The OECD has made use of a model of "Readiness, Intensity and Impact" for investigating the adoption and use of eBusiness technologies. The purpose of this paper is to propose a framework, based on this model and adapted for blended learning, to assess the readiness, intensity of adoption and impact on blended learning offerings. The framework is tested via a description of how one university has adopted and used blended learning, and investigates the quality of the learning from this approach.

Design/methodology/approach – The framework is tested via a case study involving the assessment of a blended learning approach to the delivery of a first-year undergraduate accounting unit at Victoria University, Australia. Various approaches to delivery are assessed over a two-year period. The results are drawn from a survey specifically designed to identify students' attitudes towards blended learning.

Findings – Despite having three new online options readily available for students to access, there was strong support for face-to-face delivery methods. In relation to the framework, the assessment suggested that certain aspects of the university's blended learning approach could be investigated further (particularly student readiness for different blended learning options and an overall assessment of the impact of a blended approach), to provide a more holistic view of the readiness to adopt and impact of the blended learning offerings.

Originality/value – The value of this contribution lies in the development of a unique framework to assess the impact of blended learning approaches from the viewpoint of student readiness and intensity of separate delivery approaches – whilst maintaining the need to evaluate the effectiveness of blended learning as an overall package.

Keywords Quality, Adoption, E-learning, Blended learning, Effectiveness, Research framework

Paper type Research paper

Introduction

Universities are now making more use of information and communications technologies (ICT) such as the internet, and many have adopted a "blended learning" approach to deliver course content (Wade, 2012). This approach combines traditional face-to-face teaching, typically with the use of online teaching resources. Just because an ICT or blended learning solution has been made available, this does not mean that it can automatically be assumed that university academics or students will want to adopt or to use it fully. Even if university administration does adopt this new innovation, it also cannot be assumed that its academics and students will want to use it, and even if they have little choice and are compelled to use it, that they will get the most out of it. The old saying: "You can lead a horse to water but you can't make it drink" comes to mind here (Tatnall and Manning, 2011).

It is of considerable importance to determine whether the increased use and availability of online teaching resources and the use of a blended learning approach have made a positive impact on students' academic performance and whether this is reflected in improved learning outcomes. In this paper a framework to assess blended

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learning approaches from a holistic viewpoint is developed. The idea of taking a holistic view is that the framework extends beyond examination of the tools made available to students to readiness to adopt the tools offered as part of the blended learning system (before adoption) and a formal evaluation of their performance (afterwards). The framework is tested via a case study examining a blended learning approach to the delivery of a first-year undergraduate accounting unit at Victoria University, Australia.

Blended learning

Blended learning is often described as "the mix of traditional methods of teaching, such as face-to-face teaching and online teaching" (Bliuc *et al.*, 2007, p. 233). Due to its simplicity, this is perhaps the most common meaning of blended learning used in a higher education context. To help identify the degree of blending which may occur within these two approaches, reference can be made to Figure 1 which provides a classification based on the level of online resources used. Figure 1 incorporates Jones *et al.* (2009) continuum of blended learning, which begins with no ICT use, then progresses through the most basic level of information and communication technology used to support face-to-face teaching, to intensive use, whereby the whole module is delivered online with minimal or no face-to-face interaction (Jones, 2006).

The idea behind the continuum was that it was perceived as a way in which institutions could move from traditional face-to-face approaches to an "E-intensive" approach by gradually introducing ICT as part of the delivery. The authors contend that the continuum could also be viewed in another way. As educators assemble the tools for a blended learning package, they could "select" from different options across the continuum. For instance, a learning module may include the use of presentation software in lectures (basic ICT use), online discussions (e-focused) and face-to-face tutorials that involve no ICT use.

The notion of applying ICT to support traditional methods (as opposed to gradual movement to a completely online system) is obviously not new. Dowling *et al.* (2003) analysed whether a hybrid, flexible teaching method, in comparison to traditional face-to-face lectures, improved learning outcomes. Their results suggested a positive change in student grades when a combination of the traditional approach and extensive use of multi-media resources was used.

Dunbar (2004) described and analysed the transformation of a face-to face course to an online course using an online learning platform, WebCT. The survey asked students about their preference to have a live instructor or to take the class online. The majority of students responded that they would rather take the online class.

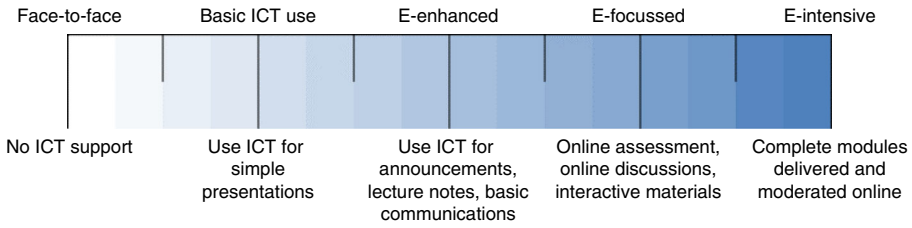

Figure 1.
Enhanced continuum of blended learning

Source: Adapted from Jones *et al.* (2009, p. 15)

However, Marriott *et al.* (2004) studied the use of ICT by undergraduate students and their views regarding internet use in accounting programmes. Students expressed their preference for a face-to-face form of educational experience and indicated that they would only endorse internet usage that supported the traditional delivery of courses, as they valued the social interaction and the communication skills they acquired from the classroom environment. Decreased social contact and the potential isolation of learning on their own was a primary concern raised in this study. Aisbitt and Sangster (2005) described the implementation and effectiveness of a new online assessment system designed to encourage and reinforce the learning of basic principles in an introductory accounting course. A positive correlation was found between student performance in the online assessments and in their final examination.

Mcdowall and Jackling (2006) analysed student perceptions of the usefulness of a Computer-Assisted Learning (CAL) package in learning accounting concepts and its influence on students' academic performance. Their results showed that positive perceptions of the usefulness of CAL significantly influenced performance. The change in the method of instruction enabled a more effective use of the technology, potentially increased teaching effectiveness and improved academic performance. Potter and Johnston (2006) investigated the association between student use of a unique, interactive, online learning system, MarlinaLS, and their learning outcomes. The results showed that students' use of the new system was positively associated with both their examination performance and the internal assessment result. Marriott and Lau (2008) conducted a qualitative study in which a series of online summative assessments were introduced into a first-year financial accounting course. Feedback from students indicated that assessment played a significant role in the teaching and learning process. Students perceived a beneficial impact on learning, motivation and engagement derived from the regular interaction with the online assessment.

Osgerby (2013) investigated students' perception of the introduction of a blended learning environment and concluded that whilst students appeared to have a positive attitude to the adoption of an organised and well-resourced ICT-based learning process, they preferred face-to-face lectures and step-by-step instruction. Research conducted by Naaj *et al.* (2012) considered student satisfaction an important factor in measuring the quality of blended learning. Their study proposed that students' satisfaction is influenced by a combination of factors which include the instructor, the technology, class management, interaction and instruction.

Thus, the jury is still out as in regards to the level of success of different blended learning approaches. Apostolou *et al.* (2011) highlighted the need for more empirical studies into the effectiveness of using technology in accounting education. This was reinforced by Marriott and Teoh (2012) in their recent investigation into an innovative approach of delivering audio and visual feedback to students using screencast technology (which allows audio and computer screen output to be combined).

A framework for adoption and use of blended learning

When businesses use online technologies to support their activities, such as production, marketing or sales, this is often known as "eBusiness" (Tohidi, 2012). When education institutions use similar technologies to support their teaching activities, it is often called "eLearning" (Sangra *et al.*, 2012). The technologies used in both are virtually identical. When considering the adoption and use of eBusiness technologies, the Organisation for Economic Co-operation and Development

(OECD, 2005, 2012) makes use of a model of readiness, intensity and impact as shown in Figure 2.

The process of adoption and use of eBusiness technologies consists of three phases:

- readiness involves preparing the technical, commercial and social infrastructures necessary to support eBusiness;
- intensity is the state or level of adoption and use of eBusiness, its volume, value and the nature of the transactions; and
- impact is the added value that is potentially created (OECD, 2005).

Whilst in universities the aims of eLearning are quite different to eBusiness, there are some parallels in that university administration, academics and students must be ready to adopt new technologies, and the level that they adopt at may vary. The resultant impact then depends on each of these. These concepts are discussed in the next section. The next section examines how the three phases of adoption identified by the OECD (2005) could be applied in the blended learning area.

Readiness, intensity and impact of blended learning

Returning to the eBusiness Indicator Framework proposed by the OECD (2005, 2012) the authors suggest that this can be related to adoption and use of blended learning. In order to examine how this might occur, it is necessary to examine each phase of the eBusiness Indicator Framework (OECD, 2005) and consider how each might be applied to blended learning in universities.

Readiness

Readiness, or as it is sometimes referred to, eReadiness, can be assessed at a number of levels. For instance, Dada (2006, p. 1) describes eReadiness as "[…] a measure of the degree to which a country, nation or economy may be ready, willing or prepared to obtain benefits which arise from information and communications technologies". At this level, eReadiness is generally considered to an assessment of various attributes, such as levels of connectivity, general business climate, available infrastructure, available human resources and so forth (Rizk, 2004). The focus of this research is obviously not at a macro level such as this. eReadiness is also used by researchers to determine the "readiness" of businesses to adopt ICT. For instance, Parker (2000) adopted a simple definition of eReadiness – it represented how prepared a business was to operate in an eBusiness marketplace. Mokhtar and Burgess (2012) examined the

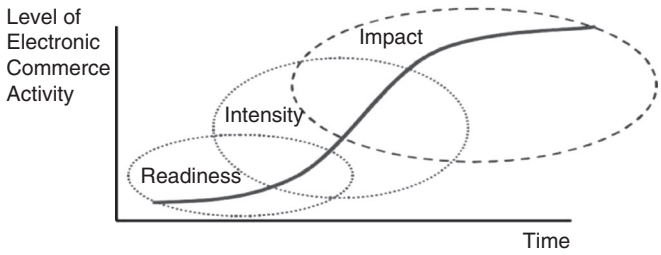

Figure 2.
eBusiness indicator framework

Source: Adapted from OECD (2005)

readiness of small business enterprises in Brunei Darussalam to use the internet according to six factors:

(1) availability of infrastructure;

(2) availability of skilled workers;

(3) available finance;

(4) support of government policies;

(5) ICT culture (willingness to use ICT); and

(6) attitude of business owners.

In regards to eReadiness and education, Whelan (2008) suggested that the benchmarks used to assess eReadiness are not specific enough to relate to the challenges faced by educators who are integrating ICT into their curricula. Abas *et al.* (2004) examined "eLearning readiness" in Malaysia according to a number of criteria:

- content readiness: availability of suitable materials;
- cultural readiness: readiness to accept eLearning;
- environmental readiness: readiness of the society and nation to accept eLearning;
- financial readiness: willingness to spend the required funds;
- learner readiness: level of time commitment, discipline and interest in eLearning;
- management readiness: support of the institution for eLearning;
- personnel readiness: existence of staff to support eLearning technical resources; and
- technical readiness: existence of necessary infrastructure.

As suggested by Whelan (2008), these criteria (apart from environmental readiness) are assessed more at the institution level than the more general eReadiness assessments carried out at the country level. Along the same lines, Machado (2007) developed a framework for assessing eReadiness in higher education institutions. This framework differentiated between the roles of administrators (to provide the necessary infrastructure but also to facilitate in building capacity for eLearning), instructors and students.

Intensity of adoption

As the discussion on readiness suggested, decisions related to the adoption of educational technologies can be complex. In order to understand the benefits and problems associated with new innovations in teaching (such as different forms of online delivery), it is useful to consider one of the theories of technological innovation (Al-Hajri and Tatnall, 2007) such as the Theory of Reasoned Action (Ajzen and Fishbein, 1980), the Theory of Planned Behaviour (Ajzen, 1991), the Technology Acceptance Model (Davis, 1986), Diffusion of Innovations (Rogers, 2003) or Innovation Translation (Callon, 1986; Latour, 1996). The Technology Acceptance Model and Diffusion of Innovations, in particular, consider characteristics of the innovation and of the potential adopter as crucial factors. One of the difficulties, however, in investigating the adoption of technological innovations is that not all innovations are adopted in the form in which they were proposed and not all are adopted without change (Tatnall, 2009), raising the question of just what was adopted in each case. The authors argue that it is fallacious to

assume that the reason for the adoption, or non-adoption, of the technology is due just, or even primarily, to the characteristics of the innovation itself. For instance, if a blended learning package is only partially adopted how can this be explained? A less than friendly interface may be one reason for only partial adoption of such packages, but there are many more possible reasons. On a human level, many academics prefer human-to-human interactions and are reluctant to use technology in this way for teaching and learning. All of this means that many academics will be likely to translate (Callon, 1986) the blended learning package into something that suits their own needs by including some aspects and not others (Tatnall and Manning, 2011).

The approach to innovation adoption used in actor-network theory (ANT) (Callon, 1986, 1999; Latour, 1986, 1996, 2005; Law, 1987, 1991, 1999), sometimes known as a sociology or translations, is that of Innovation Translation. This approach posits that innovations are often not adopted in their entirety but only after "translation" into a form that is more appropriate for use by the potential adopter (Tatnall, 2009). ANT considers the world to be full of hybrid entities (Latour, 1993) containing both human and non-human elements, and offers the notion of heterogeneity to help in the explanation of technology adoption (Tatnall and Davey, 2007). This means that in investigating adoption both human and non-human influences should be considered. In one of his early works, Latour (1986) maintains that the people involved in any innovation may react to it in different ways by modifying it, adding to it, using only some parts of it or ignoring it. The adoption of an innovation thus comes as a consequence of the actions of everyone in the chain of actors who has anything to do with it and that each actor translates and contributes its own resources to the final result (Tatnall and Gilding, 1999).

At the institution level, the readiness to adopt blended learning is reflected in the decision by an institution to adopt it. This can be supported by unit coordinators (referred to "instructors" by Machado, 2007), who incorporate it into their curriculum. Finally, it is up to students as individuals to adopt those aspects of the blended learning approach which are either required or that they perceive to be useful for their purposes. This represents their intensity of adoption. ANT fits well with the OECD model in relating to socio-technical situations where both human and non-human actors influence the resulting level of adoption. In particular the OECD concept of intensity relates closely to ANT's innovation translation where only certain parts of an innovation may be adopted.

Impact: the quality of learning

The importance of the link between readiness and intensity of adoption and the resultant impact on the quality of learning cannot be understated. Once institutions and instructors have adopted a range of options across the enhanced blended learning continuum (refer again to Figure 1) as part of their blended learning suite, it is then students' readiness that influences their intensity of adoption and thus the impact on their learning. For instance, Buzzetto-More (2008) reported that student attitudes towards technology are influential in determining the educational benefits of online learning resources and experiences.

In regards to usage, Wells *et al.* (2008) found that the use of technology in educational settings can assist in the achievement of learning outcomes. Research conducted by Perera and Richardson (2010) suggested that the quality of the actual time spent online may be influential on learning outcomes. This provided some support for an earlier study by Davies and Graff (2005) which found that students

interacting less frequently with online resources performed less well academically. Williams *et al.* (2012) explored the relationship between levels of student engagement with online quizzes and their academic performance. It was found that students who attempted the online quizzes multiple times performed much better than those who attempted the quizzes fewer times.

de Lange *et al.* (2003) investigated the use of the online learning system, WebCT, and found that various design features of WebCT, such as the provision of lecture notes, use of bulletin board and online assessment significantly influenced the level of student satisfaction. Rainsbury and Malcolm (2003) focused on whether students perceived the use of an online discussion board as beneficial to their learning. Whilst results showed that the use of the discussion board contributed positively to students' perception of increased learning, this had an insignificant impact on their final examination performance. Abdolmohammadi *et al.* (2003) examined the implementation of a web-assisted course enhanced learning. Responses from their Student Evaluation of Teaching survey found no significant difference in students' level of understanding of the subject matter. It found that students did not find the course web site useful and therefore did not use it extensively. Thus, the impact of blended learning is assessed through some measurement of the quality of learning achieved. Examples already mentioned include overall student performance, assessments of student satisfaction and so forth.

Theoretical framework

Figure 3 represents a theoretical framework, based on the OECD eBusiness Indicator framework but tailored for higher education institutions, which provides an overview of the blended learning experience in regards to:

- Readiness: taking into consideration institution readiness, staff readiness and student readiness.

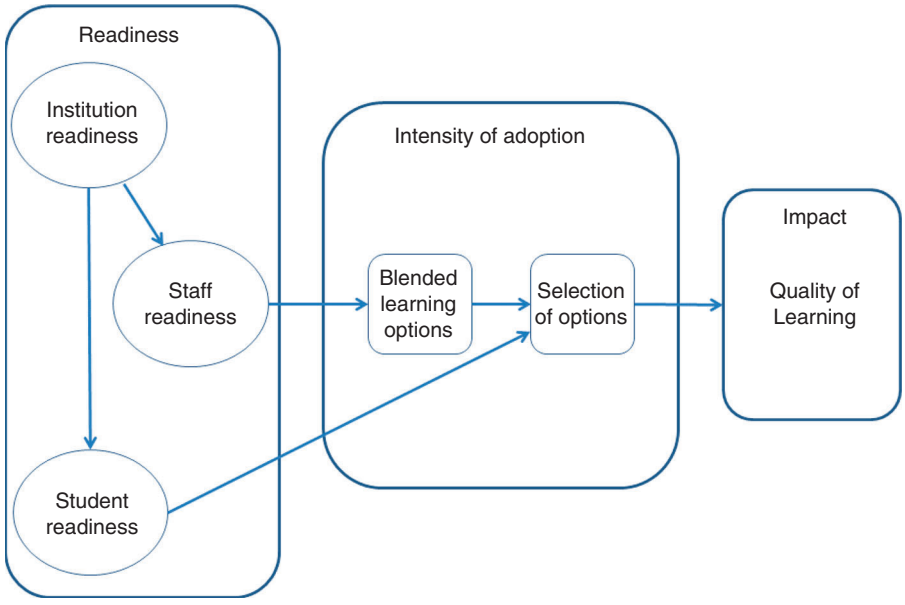

Figure 3.
Blended learning assessment (BLA) framework: readiness, intensity of adoption of blended learning and its impact on quality of learning achieved

- Intensity of adoption: in this instance the intensity of adoption considers the blended learning options selected for adoption by staff and the adoption of those options by students.
- Impact: or quality of learning achieved. Quality of learning can be assessed via a number of means as discussed in the previous section.

It is important to remember that the framework can be used to examine different stages of adoption of blended learning packages. For instance, when considering the initial adoption of blended learning it would be useful to concentrate upon the readiness aspect of the framework. When examining the section of blended learning options by students, the intensity of adoption section of the framework would be considered, with some reference to staff and student readiness also likely. In regards to the quality of learning achieved it is likely that the impact section of the framework will be considered in conjunction alongside the intensity of adoption as different blending learning options are likely to be assessed.

Research objective

The overall objective of this research is to test and refine the Blended Learning Assessment Framework via its application in an actual situation. In this instance, the setting is the delivery of a first-year accounting unit at Victoria University, Australia. The coordinator of the unit, an author of this paper, introduced blended learning into the unit in 2006. The BLA framework was used to assess the selection of blended learning options by students and the subsequent impact on their quality of learning. As such, this assessment of the blended learning suite concentrates upon the intensity of adoption and impact sections of the framework.

To achieve these objectives, the following research questions will be addressed:

RQ1. What is the intensity of the adoption for the blended learning options available?

RQ2. What are the students' perceptions of the impact of blended learning options?

Background

Victoria University is located in the State of Victoria, Australia and has one of the most culturally and linguistically diverse student populations within the state. With a number of campuses based in the state's capital city, Melbourne, the university has a large number of first-generation university entrants, the first in their family to attend university. Also included amongst its student population are those from a low socio-economic background. It is therefore important to provide additional support for their specific learning needs. One of Victoria University's key strategies is to enhance the quality of the learning experience by incorporating a greater use of technology in the teaching and learning process; this trend towards blended learning is emerging as perhaps the most prominent method of delivery in higher education (Bonk and Graham, 2006). Since 2006 there has been an increasing amount of online resources used in Victoria University's introductory accounting unit.

This paper reports on part of an ongoing research project which monitors the technological changes implemented in a compulsory first-year introductory accounting unit for students undertaking a Bachelor of Business.

The first-year accounting unit examined in the study introduced students to the real-life application of accounting principles and practices within a business context. With enrolments in excess of 400 local students each semester, it is Victoria University's largest accounting cohort. This represents a diverse group of accounting and non-accounting students from a broad spectrum of business majors which range from music through to marketing. Only a minority of these students are accounting majors. This is one of the major challenges in engaging these students in the learning of accounting as it is an area of study in which there is little or no interest. As mentioned earlier, the coordinator of the unit is also a co-author of this paper.

Whilst the emphasis of this paper is not on the readiness aspect of the BLA framework, it is useful to briefly address readiness to introduce how blended learning was introduced. WebCT was introduced into the first-year accounting unit in Semester 1/2006. There was a decision made at the institution level that each unit would at least have a WebCT web page and an expectation that WebCT would be used "in some way" by staff in relation to the delivery of all units. In regards to readiness, staff were provided with a basic level of training for use of WebCT and support areas were made available within the university to support development of curriculum around various WebCT features. Students were provided with a basic level of online teaching resources which included lecture notes and examination solutions. In each of the following semesters, additional resources were made available. There was also greater use of communication tools, in particular online chat and discussion boards for students to communicate with each other and their lecturers via WebCT.

In Semester 1/2010, students were introduced to three new online learning options to complement traditional face-to-face lectures and tutorials. The first of these options was the viewing of recorded lectures via Lectopia, an automated lecture recording and web publishing tool. Students had immediate access to an audio-visual recording of a lecture which generally comprised lecture slides, commentary and illustrations using links to web sites where relevant. Whilst this could be downloaded and viewed at their convenience, it did not, however, provide for any student interaction via discussion board or any other online chat facilities.

The second option enabled students the opportunity to enrol and actively participate in online tutorials via Elluminate Live which is an online collaborative session. To join the online tutorial they were required to login to the Elluminate Live web site each week at a regular designated time. These sessions were conducted by the unit coordinator. The transfer of knowledge and review of tutorial content was facilitated through shared files or a shared whiteboard where students could also take control of the screen for direct input. Interaction between the online tutor and students was through an onscreen dialogue sidebar or speaking directly via microphone or headset. Each of the Elluminate Live tutorials were recorded and posted on WebCT by the end of each week.

The third option allowed students to download and review the audio-visual content from the Elluminate Live tutorials. As with the first option of the recorded lectures, this was a passive viewing option. Access to all these additional online resources was via the unit web site on WebCT.

Methodology

The research being reported in this paper involved a case study conducted over four consecutive semesters commencing from Semester 1/2010 through to Semester 2/2011. The case study approach has been used on a number of occasions to examine

blended learning in higher education institutions. For instance, Motteram (2006) examined the role of blended learning (face-to-face and "virtual" delivery) in a master's programme at a UK university. So and Brush (2008) examined, amongst other things, student perceptions and satisfaction with a blended learning environment in a health education course in a US university. More recently, Taylor and Newton (2013) conducted a case study that examined blended learning practices at an Australian regional university faced with the challenges of delivering both on-campus and distance learning programmes. It identified students' perceptions of traditional and online methods of delivery as per the research questions. The primary source of statistical data used in this paper was a series of surveys specifically designed to identify students' attitudes towards blended learning in the first-year accounting unit. As part of their study, So and Brush (2008) conducted both surveys and interviews with the student cohort. In this particular case, the type of data to be collected and the size of the student body meant that a survey was most suited for the collection of data, due to its ability to allow the researcher to collect data from large populations (Leedy and Ormrod, 2013).

The length of the survey was limited to three pages to encourage greater student participation and required approximately 10-15 minutes to complete.

The survey instrument comprised three sections. The first section requested information related to the socio-economic and educational background of respondents. The second section examined the students' study preferences towards the various blended learning options available to them. Each of the options were listed and students were asked to rate their effectiveness of each in assisting their learning in this unit by using a four-point rating scale. The third section provided an overview of the students' learning experience in the unit of study. Students were asked to respond to a series of statements relating to quality of teaching, assessment, workload and their attitudes towards study. For the purposes of this paper, data have been extracted from the first and second section of the survey.

Demographic profile

Table I provides a summary of the survey respondents across the four semesters of the study. Overall, there were 515 usable responses to the survey. Enrolments were generally higher in Semester 1 of each year. The overall response rate to the survey over this period was just over 26 per cent, which was a reasonably successful rate given the time needed to complete the survey. The demographic profile of respondents across the four semesters suggests that the respondent groups generally had similar profiles across the study period.

Practical application of the research framework

When considering the usefulness of the framework for assessing new blended learning initiatives at Victoria University, the first thing that became apparent was that there was a need to develop an "operationalised" version of the framework that allowed for an assessment of the intensity of adoption and impact of the blended learning initiatives. As such, it was considered that it would be useful to separate existing approaches to delivery from new approaches that are added to form a new blended learning environment. Additionally, these should be reflected in the Intensity of adoption section of the framework so that different approaches can be assessed separately – with an overall assessment of the complete package also provided. This is presented in Table II.

	Semester 1/2010	Semester 2/2010	Semester 1/2011	Semester 2/2011
Number of students enrolled at end of semester	561	495	468	424
Sample size	172	112	144	87
% of participants to overall student population	31	23	31	20
Gender (%)				
Male	56	37	53	47
Female	44	63	47	53
Year of study (%)				
1st	64	67	67	70
Other	36	33	33	30
Work and study (%)				
Not working	27	25	31	31
1-10 hours of work	16	9	11	14
11-20 hours of work	30	44	31	30
21-30 hours of work	15	12	16	14
Greater than 30 hours	12	10	11	11
Age (%)				
Less than 20 years	44	36	39	36
20-29 years	47	58	49	52
30 years or older	9	6	12	12

Table I.
Demographic profile of survey participants

BLA framework stage		Blended learning approach					
Readiness	Institution	Not assessed in this study					
	Staff	Not assessed in this study					
	Student	Not assessed in this study					
Intensity of adoption	Blended learning options	Existing approaches			New approaches		
		Approach A	Approach B	Approach C	Approach D	Approach E	Approach F
	Selection of options						
Impact	Effectiveness						
	Overall effectiveness	Not assessed in this study					

Table II.
Operationalised implementation of BLA framework

Findings

RQ1: intensity of adoption

The research framework is quite generic, and allows for a variety of methods for assessing the intensity of adoption of the different blended learning approaches by specific researchers. In this instance, a simple measure was used. Survey respondents were asked to rate the different packages made available to them according to whether they used that option at least once during the semester. The results are shown in the second column of Table III. The results show quite clearly that:

- face-to-face delivery was used by nearly all students (lectures by 97 per cent of students and tutorials by 96 per cent of students);

- nearly three-quarters (72 per cent) of respondents viewed at least one recorded lecture (Lectopia); and
- less than half of the students used Elluminate Live tutorials (48 per cent) or lectures (44 per cent).

It is to be remembered that most students came from backgrounds where face-to-face delivery was the standard method of delivery, and this was certainly the case with most other Victoria University units that were studied, which would have incorporated predominantly face-to-face lectures and tutorials with some support materials offered via WebCT.

RQ2: impact on learning

To gauge how students perceived the effectiveness of each of the blended learning approaches, a four-point rating scale was used with 1 = not at all effective, 2 = some effect, 3 = effective and 4 = very effective. Table III summarises the results for these measures.

Note that in addition to the mean score for each approach, the median and mode have also been included. This is because there is an argument in some circles that suggests that mean and standard deviation are not suitable for the analysis of ordinal values, such as the ratings scales used in this study. In these instances it might be more appropriate to employ mode or median values (Jamieson, 2004). Standard deviation values add little to the analysis in this instance as the results from this study are quite predicable – delivery methods with higher scale values (such as the face-to-face approaches) obviously had a lower standard deviation and those with middle range scores had higher standard deviations. Little is gained from their inclusion. The final column of Table III includes a determination of the overall effectiveness of each of the blended learning delivery options, determined on the basis of the mean, median and mode results.

It is also interesting to examine whether or not the mean differences (in regards to the effectiveness of the various approaches) are significantly different. In order to assess this for each combination a series of χ^2-tests were conducted. These are presented in Table IV.

In this instance, there were significant differences in regards to the effectiveness of all the delivery approaches, except for the two face-to-face approaches, where a significant difference could not be ascertained in effectiveness between face-to-face lectures and tutorials. However, in regards to all of the findings in Table IV it must be

Blended learning option	Adoption (%)	Effectiveness Mean	Median	Mode	General assessment
Lectures – face-to-face	97	3.40	4	4	Between effective and very effective (3 and 4)
Tutorials – face-to-face	96	3.24	4	3	Between effective and very effective (3 and 4)
Lectopia viewing recorded lectures	72	2.86	3	3	Effective (3)
Elluminate-tutorials	48	2.50	3	3	Between some effect and effective (2 and 3)
Elluminate Live – online tutorials	44	2.52	3	3	Between some effect and effective (2 and 3)

Table III.
Summary of results for effectiveness of learning options

remembered that there were over 500 respondents to the survey and as the number of observations increases there is an increasing likelihood that significant differences will be recorded between sets of values. Thus, in these instances it is important to bring the results back to the scales that were used in the survey. The final column of Table III provides a judgement of the overall effectiveness of the different approaches on the basis of the mean, median and mode values for each approach. When this is combined with the results of Table IV, it is reasonable to assess the following in regards to the effectiveness of the different teaching approaches employed in the study:

- Face-to-face approaches were viewed as being the most effective.
- Lectopia recorded lectures were considered to be "effective".
- Both Elluminate approaches were considered to be the least effective of the provided options.

It is also interesting that there is a strong correlation (0.9876) between the values presented in the adoption column and the mean effectiveness column in Table III. This does not necessarily imply that the perception of effectiveness drives the level of adoption, but this is a possibility and is worth further investigation.

Despite having three new online options readily available via WebCT; the viewing of recorded lectures, the viewing of recorded tutorials and participation in an online tutorial, there was strong support for face-to-face lectures and tutorials. These two traditional styles of delivery were rated as the preferred learning options with the highest levels of adoption as well as the highest scores for effectiveness over the four semester period (being recognised as "most effective" by students).

Students perceived face-to-face lectures as the most effective option in assisting their learning in this unit, closely followed by face-to-face tutorials. Of the online options, the viewing of recorded lectures rated the highest, but well below the face-to-face options. These results appear to be consistent with research by Halabi *et al.* (2005) on student attitudes towards tele-teaching and traditional face-to-face contact. Preference for face-to-face teaching was reported in this study and more recently by Osgerby (2013) who concluded that whilst students appeared to have a positive attitude to the adoption of an organised and well-resourced ICT-based learning options, they still preferred traditional lectures and step-by-step instruction. Over the four semesters, the viewing of recorded tutorials and participation in online tutorials rated the lowest of all the learning options. These low scores are perhaps indicative of their

	Lectures face-to-face	Lectopia recorded lectures	Tutorials face-to-face	Elluminate tutorials	Elluminate Live online tutorials
Lectures face-to-face		0.0000*	0.1607	0.0000*	0.0000*
Lectopia recorded lectures			0.0021*	0.0068*	0.0128*
Tutorials face-to-face				0.0000*	0.0000*
Elluminate tutorials					0.0215*
Elluminate live online tutorials					

Notes: Cells represent p-value of χ^2-test comparing different delivery modes. Value <0.05 shows a significant difference ($*p < 0.05$)

Table IV.
Comparison of differences of effectiveness of different delivery modes

preference for active involvement through student interaction rather than passive viewing of online recordings. Bates and Poole (2003, p. 98) stated that "most theories of learning suggest that for learning to be efficient, it needs to be active [...] the learner must respond in some way to the learning material". Students learn better when they are actively engaged with their learning rather than being passive receptacles of information.

Despite the constant promotion of the online tutorial (Elluminate) as a new and flexible learning option over the four semester period, the enrolments remained low. The number of participants would fluctuate from week to week. This may be perceived to be a benefit to the participants as it provided a more personalised learning experience compared to a traditional classroom tutorial of 25 students. As an instructor, one is able to better gauge the level of understanding of each individual student through the one-to-one interaction online in which student anonymity is maintained. This seemed to encourage more open discussion amongst students and provide a more active and collaborative learning experience, particularly for those students who feel uncomfortable asking questions in a large tutorial group. There were numerous attempts by the unit coordinator to raise student awareness of these online tutorials over the four semesters, but this did not seem to improve the low number of enrolments nor strengthen the students' perception that this was a viable alternative to face-to-face learning.

Table V provides an overview of how the framework might be viewed taking Victoria University's assessment of blended learning into account. Whilst a useful examination of the different approaches occurred, there was no assessment of the effectiveness of the blended learning approach as a whole. Additionally, future assessments should include reference to the role that student readiness played in level of adoption of different learning approaches. This is one of the benefits of the BLA framework – it can help to identify areas that effect the implementation of blended learning suites that may not necessarily be considered by implementers.

BLA framework stage		Blended learning approach				
Readiness		Not assessed in this study				
Intensity of adoption	Blended learning options	Existing approaches		New approaches		
		Lectures	Tutorials	Lectopia viewing recorded lectures	Elluminate viewing tutorials	Elluminate Live participating in online tutorials
	Blended learning continuum	Face-to-face	Face-to-face	E-enhanced	E-enhanced	E-focused
	Selection of options	High adoption	High adoption	3/4 adopted	Under 1/2 adopted	Under 1/2 adopted
Impact	Effectiveness	Between "effective" and "very effective"	Between "effective" and "very effective"	Effective	Between "some effect" and "effective"	Between "some effect" and "effective"
	Overall effectiveness	Not assessed in this study				

Table V.
Victoria university blended learning assessment

Conclusion

This paper addressed the notion of evaluating various blended learning approaches and developed a framework for the assessment of blended learning based on readiness (to adopt different aspects of blended learning), intensity (or level) of adoption and impact. The framework was tested through the assessment of a blended learning programme in first-year accounting at Victoria University.

The results of this research showed that the approaches to learning offered within the unit ranged from the traditional face-to-face delivery methods, through to e-enhanced options (Lectopia lectures and Elluminate tutorials) and e-focused delivery (Elluminate Live real-time tutorials) on the enhanced continuum of blended learning. The study results indicated that despite having three new online options at Victoria University that were readily available via WebCT, there was strong support for face-to-face lectures and tutorials. These two traditional styles of delivery were rated as the preferred learning options with the highest levels of adoption as well as the highest mean scores for learning effectiveness over the four semester period.

This exercise allowed the authors to reflect upon the assessment framework and to develop a practical, operationalised version to include a separation of existing approaches to delivery and newer blended learning approaches – with respective measurement of intensity of adoption and individual effectiveness. Additionally, an "overall assessment" section was added to the framework to review the success of the blended learning package as a whole. This is an important addition to the framework as in a blended learning programme learners often have some freedom to construct their own learning environment and it is as important to evaluate the effectiveness of this individualised "suite" of learning for each participant on an overall basis as it is to assess each individual approach that is offered along the blended learning continuum. The application of the framework is important from a practical viewpoint when introducing blended learning into higher education as planners and implementers will consider the readiness to adopt, the blended learning options available and how their impact will be assessed before any implementation occurs. This provides a more holistic approach to the implementation of blended learning options and ensures that the impact of the blended learning approach is considered during its design rather than as an afterthought after implementation.

From the perspective of the unit coordinator in the case study, the evaluation of new blended learning initiatives at Victoria University has provided some insight as to where future efforts need to be directed to improve the quality of the learning experience in this first-year accounting unit. Although the study focused primarily on the intensity of adoption and impact aspects of the framework, it is suggested that further effort could be made to assess the student readiness in regards to the adoption of individual blended learning options – for instance, can the reasons for lack of adoption of the online options be traced back to certain aspects of student readiness? Additionally, there needs to be an assessment of student's evaluation of the overall blended learning suite of offerings.

References

Abas, Z.W., Kaur, K. and Harun, H. (Eds) (2004), *E-Learning Readiness in Malaysia 2004*, Ministry of Energy, Water and Communications, Malaysia and Open University, Kuala Lumpur.

Abdolmohammadi, M., Howe, M. and Ryack, K. (2003), "Students' perceptions of learning in a web-assisted financial statement analysis course", *Advances in Accounting Education*, Vol. 5, pp. 181-197.

Aisbitt, S. and Sangster, A. (2005), "Using internet-based on-line assessment: a case study", *Accounting Education*, Vol. 14 No. 4, pp. 383-394.

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Ajzen, I. and Fishbein, M. (1980), *Understanding Attitudes and Predicting Social Behavior*, Prentice-Hall, Englewood Cliffs, NJ and London.

Al-Hajri, S. and Tatnall, A. (2007), "Internet technology in Omani Banks – a case of adoption at a slower rate", in Markus, M.L., Hampe, J.F., Gricar, J., Pucihar, A. and Lenart, G. (Eds), *20th Bled E-Conference, Emergence: Merging and Emerging Technologies, Processes and Institutions, Bled*, pp. 1-11.

Apostolou, B., Hassell, J.M., Rebele, J. and Watson, S.F. (2011), "Accounting education literature review (2006-2009)", *Journal of Accounting Education*, Vol. 28 Nos 3/4, pp. 145-197.

Bates, A.W. and Poole, G. (2003), *Effective Teaching with Technology in Higher Education – Foundations For Success*, 1st ed., Jossey-Bass – A Wiley Imprint, San Francisco, CA.

Bliuc, A.-M., Goodyear, P. and Ellis, R.A. (2007), "Research focus and methodological choices in studies into students' experiences of blended learning in higher education", *The Internet and Higher Education*, Vol. 10 No. 4, pp. 231-244.

Bonk, C.J. and Graham, C.R. (2006), *The Handbook of Blended Learning – Global Perspectives, Local Designs*, Pfeiffer – An Imprint of Wiley, San Francisco, CA.

Buzzetto-More, N.A. (2008), "Student perceptions of various e-learning components", *Interdisciplinary Journal of E-Learning and Learning Objects*, Vol. 4 No. 1, pp. 113-135.

Callon, M. (1986), "Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay", in Law, J. (Ed.), *Power, Action & Belief. A New Sociology of Knowledge?*, Routledge & Kegan Paul, London, pp. 196-229.

Callon, M. (1999), "Actor-network theory – the market test", in Law, J. and Hassard, J. (Eds), *Actor Network Theory and After*, Blackwell Publishers, Oxford, pp. 181-195.

Dada, D. (2006), "E-readiness for developing countries: moving the focus from the environment to the users", *The Electronic Journal of Information Systems in Developing Countries*, Vol. 27 No. 6, pp. 1-14.

Davies, J. and Graff, M. (2005), "Performance in eLearning: online participation and student grades", *British Journal of Education Technology*, Vol. 36 No. 4, pp. 657-663.

Davis, F. (1986), "A technology acceptance model for empirically testing new end-user information systems: theory and results", doctor of philosophy thesis, MIT, Cambridge, MA.

de Lange, P., Suwardy, T. and Mavondo, F. (2003), "Integrating a virtual learning environment into an introductory accounting course: determinants of student motivation", *Accounting Education*, Vol. 12 No. 1, pp. 1-14.

Dowling, C., Godfrey, J.M. and Gyles, N. (2003), "Do hybrid flexible delivery teaching methods improve accounting students' learning outcomes?", *Accounting Education*, Vol. 12 No. 4, pp. 373-391.

Dunbar, A.E. (2004), "Genesis of an online course", *Issues in Accounting Education*, Vol. 19 No. 3, pp. 321-343.

Halabi, A.K., Tuovinen, J.E. and Farley, A.A. (2005), "Empirical evidence on the relative efficiency of worked examples versus problem-solving exercises in accounting principles instruction", *Issues in Accounting Education*, Vol. 20 No. 1, pp. 21-32.

Jamieson, S. (2004), "Likert scales: how to (ab) use them", *Medical Education*, Vol. 38 No. 12, pp. 1217-1218.

Jones, N. (2006), "E-College Wales, a case study of blended learning", in Bonk, C.J. and Graham, C.R. (Eds), *Handbook of Blended Learning: Global Perspectives, Local Designs*, Pfeiffer Publishing, San Francisco, CA, pp. 182-194.

Jones, N., Chew, E., Jones, C. and Lau, A. (2009), "Over the worst or at the eye of the storm?", *Education + Training*, Vol. 51 No. 1, pp. 6-22.

Latour, B. (1986), "The powers of association", in Law, J. (Ed.), *Power, Action and Belief. A New Sociology of Knowledge? Sociological Review Monograph 32*, Routledge & Kegan Paul, London, pp. 264-280.

Latour, B. (1993), *We have Never Been Modern*, Harvester University Press, Cambridge, MA.

Latour, B. (1996), *Aramis or the Love of Technology*, Harvard University Press, Cambridge, MA.

Latour, B. (2005), *Reassembling the Social: An Introduction to Actor-network Theory*, Oxford University Press, Oxford.

Law, J. (1987), "Technology and heterogeneous engineering: the case of Portuguese expansion", in Bijker, W.E., Hughes, T.P. and Pinch, T.J. (Eds), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*, MIT Press, Cambridge, MA, pp. 111-134.

Law, J. (Ed.) (1991), *A Sociology of Monsters. Essays on Power, Technology and Domination*, Routledge, London.

Law, J. (1999), "After ANT: complexity, naming and topology", in Law, J. and Hassard, J. (Eds), *Actor Network Theory and After*, Blackwell Publishers, Oxford, pp. 1-14.

Leedy, P.D. and Ormrod, J.E. (2013), *Practical Research: Planning and Design*, 10th ed., Pearson, Essex.

Mcdowall, T. and Jackling, B. (2006), "The impact of computer-assisted learning on academic grades: an assessment of students' perceptions", *Accounting Education*, Vol. 15 No. 4, pp. 377-389.

Machado, C. (2007), "Developing an e-readiness model for higher education institutions: results of a focus group study", *British Journal of Educational Technology*, Vol. 38 No. 1, pp. 72-82.

Marriott, P. and Lau, A. (2008), "The use of on-line summative assessment in an undergraduate financial accounting course", *Journal of Accounting Education*, Vol. 26 No. 2, pp. 73-90.

Marriott, P. and Teoh, L.K. (2012), "Using screencasts to enhance assessment feedback: students' perceptions and preferences", *Accounting Education*, Vol. 21 No. 6, pp. 583-598.

Marriott, N., Marriott, P. and Selwyn, N. (2004), "Accounting undergraduates' changing use of ICT and their views on using the internet in higher education – a research note", *Accounting Education*, Vol. 13 No. 4, S1, pp. 117-130.

Mokhtar, N.F. and Burgess, S. (2012), "The use of the internet by small business enterprises in Brunei Darussalam", *Global Business & Economics Anthology*, Vol. 1, pp. 167-175.

Motteram, G. (2006), "'Blended' education and the transformation of teachers: a long-term case study in postgraduate UK Higher Education", *British Journal of Educational Technology*, Vol. 37 No. 1, pp. 17-30.

Naaj, M.A., Nachouki, M. and Ankit, A. (2012), "Evaluating student satisfaction with blended learning in a gender-segregated environment", *Journal of Information Technology Education: Research*, Vol. 11, pp. 185-200.

OECD (2005), "Guide to measuring the information society", Working Party on Indicators for the Information Society, Committee for Information, Computer and Communications Policy, Paris, available at: www.oecd.org/sti/sci-tech/36177203.pdf (accessed 25 January 2013).

OECD (2012), *OECD Handbook on Measuring the Space Economy*, OECD Publishing, Paris, available at: http://dx.doi.org/10.1787/9789264169166-en (accessed 24 January 2013).

Osgerby, J. (2013), "Students' perceptions of the introduction of a blended learning environment: an exploratory case study", *Accounting Education*, Vol. 22 No. 1, pp. 85-99.

Parker, S. (2000), *A Survey of Small Business in Colorado*, Colorado Community College and Occupational Education System, Denver, CO.

Perera, L. and 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*, Vol. 19 No. 6, pp. 587-600.

Potter, B.N. and Johnston, C.G. (2006), "The effect of interactive on-line learning systems on student learning outcomes in accounting", *Journal of Accounting Education*, Vol. 24 No. 1, pp. 16-34.

Rainsbury, E. and Malcolm, P. (2003), "Extending the classroom boundaries - an evaluation of an asynchronous discussion board", *Accounting Education*, Vol 12 No. 1, pp. 49-61.

Rogers, E.M. (2003), *Diffusion of Innovations*, 5th ed., The Free Press, New York, NY.

Rizk, N. (2004), "E-readiness assessment of small and medium enterprises in Egypt: a micro study", *Topics in Middle Eastern and North African Economies*, Vol. 6, available at: www.luc.edu/orgs/meea/ (accessed 14 April 2011).

Sangra, A., Vlachopoulos, D. and Cabrera, N. (2012), "Building an inclusive definition of e-learning: an approach to the conceptual framework", *The International Review of Research in Open and Distance Learning*, Vol. 13 No. 2, available at: www.irrodl.org/index.php/irrodl/article/view/1161/2146 (accessed 7 September 2013).

So, H. and Brush, T.A. (2008), "Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: relationships and critical factors", *Computers & Education*, Vol. 51 No. 1, pp. 318-336.

Tatnall, A. (2009), "Information systems, technology adoption and innovation translation", *International Journal of Actor-Network Theory and Technological Innovation*, Vol. 1 No. 1, pp. 59-74.

Tatnall, A. and Davey, W. (2007), "Researching the portal", in Khosrow-Pour, M. (Ed.), *IRMA: Managing Worldwide Operations and Communications with Information Technology*, Information Resources Management Association (IRMA), Hershey, PA, pp. 365-368.

Tatnall, A. and Gilding, A. (1999), "Actor-network theory and information systems research", in Hope, B. and Yoong, P. (Eds), *10th Australasian Conference on Information Systems (ACIS). Vol. 2*, Victoria University of Wellington, Wellington, pp. 955-966.

Tatnall, A. and Manning, K. (2011), "Innovation or renovation? The management of strategic and adoption decisions within a university", in Tatnall, A., Kereteletswe, O.C. and Visscher, A.J. (Eds), *Information Technology and Managing Quality Education*, Springer, Heidelberg, pp. 113-120.

Taylor, J.A. and Newton, D. (2013), "Beyond blended learning: a case study of institutional change at an Australian regional university", *The Internet and Higher Education*, Vol. 18, July, pp. 54-60.

Tohidi, H. (2012), "The concepts of e-business and its various models and their mutual effect on each other", *AWER Procedia Information Technology & Computer Science*, *2nd World Conference in Information Technology*, pp. 1241-1244.

Wade, R. (2012), "Pedagogy, places and people", *Journal of teacher Education for Sustainability*, Vol. 14 No. 2, pp. 147-167.

Wells, P., de Lange, P. and Fieger, P. (2008), "Integrating a virtual learning environment into a second-year accounting course: determinants of overall student perception", *Accounting & Finance*, Vol. 48 No. 3, pp. 503-518.

Whelan, R. (2008), "Use of ICT in education in the South Pacific: findings of the Pacific eLearning observatory", *Distance Education*, Vol. 29 No. 1, pp. 53-70.

Williams, A., Birch, E. and Hancock, P. (2012), "The impact of online lecture recordings on student performance", *Australasian Journal of Educational Technology*, Vol. 28 No. 2, pp. 199-213.

Further reading

Entwistle, N., McCune, V. and Hounsell, J. (2002), *Approaches to Study and Perceptions of University Teaching-Learning Environments: Concepts, Measures and Preliminary Findings*, University of Edinburgh, Edinburgh, available at: www.ed.ac.uk/etl/docs/ETLreport1.pdf; www.ed.ac.uk/etl/docs/ETLreport1.pdf (accessed 22 January 2013).

Ginns, P. and Ellis, R. (2007), "Quality in blended learning: exploring the relationships between on-line and face-to-face teaching and learning", *Internet & Higher Education*, Vol. 10 No. 1, pp. 53-64.

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