DOES TECHNOLOGY USE AFFECT UNIVERSITY STUDENTS' PERCEPTION OF VALUE?

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ABSTRACT

The perceptions of university students with respect to the value of electronic delivery of various aspects of education were explored. There were some variations between student groups in reported usefulness and usability of the available technologies, in the values ascribed to various benefits and costs associated with use of technology, and in the values of the commonly cited benefits of flexibility in study time, place and method. Overall, students indicated only neutral liking for learning online, but a relatively high value for online educational delivery; provision of resources was the most highly valued feature, students were most concerned about loss of value due to reduced interaction with instructors and fellow students.

1. INTRODUCTION

Universities are using online programs and support mechanisms both for student flexibility, and to achieve efficiency and productivity gains (Scheines et al 2005). This changes the relationship between student and institution, and raises questions about whether there is any impact on the value that the student perceives in the relationship.

Service value has been the focus of considerable recent research, but little empirical work has explored the meaning and implications for service value of increased e-service in education. An early study by Shaw and Marlow (1999) suggested that students "were uncomfortable with computers, were unhappy about the lack of personal contact and would prefer to learn in a more traditional mode". Shaw and Marlow found very little difference in attitude based on gender, but they did note that "there was a tendency for more advanced cohorts to feel less content with the delivery of the course content in the online environment. The first year students had a more positive perception of the ICT system". There have, however, been a number of studies that have attempted to establish what factors contribute to "successful" e-learning projects (for example, Smith (2005) and the review by Fetaji (2007)). There has also been some discussion of strategies that might be used to overcome the most commonly perceived problem – that of lack of engagement of students with the e-learning medium; for instance the Horizon project (2007) predicts that in the near term the focus will be on technologies that concentrate on user-created content and social networking, such as wikis and various styles of blog, followed by increasing use of mobile phones and virtual worlds. Later again, the Horizon project suggests that increased use will be made of massively multiplayer educational gaming.

This paper reports on an ongoing project that is investigating the implications of technology usage for service delivery in tertiary education. Previously, Bruff et al (2006) used a brief online open-ended survey to seek students' views on the future of bricks-and-mortar universities, given increasing technology use. Content analysis produced eight key themes related to the trade-off between online and face-to-face teaching. Of particular interest were the themes concerned with the inherent value of technology to students. These provided the impetus for the work reported here. The current study investigated students' attributions and priorities with respect to the value of increased technology use in tertiary education, and tested differences based on student sub-groups and backgrounds. Its specific objectives were to address the following questions:

1. What is the current attitude of students with regard to technology use?
2. To what degree do students agree that they benefit from various outcomes of technology use?
3. Why are these benefits valued?
4. Do the answers to these questions vary depending on the attitudes and demographics of the students?

2. METHODOLOGY

This phase of the study began by using a qualitative method (focus groups) to explore the experiences of a small but representative group of students. Then, based on these findings, a quantitative method (a survey) was used to explore the issues in more depth with a larger population sample.

2.1 Focus Groups

First, two focus groups were held with students from business–related disciplines. The questions put to the focus groups were intended to confirm and possibly expand the range of technology value related issues raised by students in the previous qualitative study regarding the future of bricks-and-mortar universities. (Bruff et al 2006).

Focus group findings were used to further develop the themes which had emerged from the authors' prior study. These themes were then used to develop survey questions, probing how and why specific technologies added or reduced value in the experiences of students. The survey also collected student demographic data.

2.2 The Survey Population

Participants were recruited towards the end of 2006 from different sub-groups:
1. Students at various public locations on the Callaghan and Ourimbah campuses of the University of Newcastle, Australia.
2. Four on-campus undergraduate and two on-campus postgraduate classes, with no affiliation with the researchers. However, the available classes were all within the Faculty of Business and Law, leading to a large number of these students in the final sample.

Participation was completely voluntary. All respondents completed a paper-based survey.

2.3 The Sample

The sample consisted of 277 students, 42% male and 58% female. Of the respondents, 85% were in the age range 18-24, and 11.7% were aged between 25 and 34. Respondents were fairly evenly spread over 4 years of undergraduate study (14.9% year 1, 22.7% year 2, 36.4% year 3, and 25.3% year 4); only 2 postgraduate students responded. Most of the students (90.3%) were studying primarily within the Business and Law Faculty; 7.8% were from the Faculty of Science and IT. The majority of respondents (83.7%) were studying at the University of Newcastle's main campus at Callaghan, while 8.7% were studying at the smaller Ourimbah campus which is situated about 100km to the south. Only 1.9% of students indicated that they were studying part online, and a further 0.8% were studying fully online. The University of Newcastle attracts many students from outside the major metropolitan areas in addition to local Newcastle students, so while 60.1% of students had spent most of their lives in the Newcastle area, quite a large part of the sample (30.6%) had spent most of their lives in other country areas of the state of New South Wales, Australia. Most of the students had good access at home to computing facilities with almost 83% rating them as adequate or highly adequate.

2.4 The Survey Structure

The survey first established the extent of use of various technologies by the sample group, and how they felt about using technology and learning online. It then explored the degree to which the various benefits of the

technologies were valued, and why. Next, it probed the extent to which students reported they were making a range of sacrifices when they used an online learning option. It then examined students' overall perception of the value of online services. Items were developed from the literature (Agarwal & Prasad 1999), the authors' previous study, and the focus groups. Each scale item employed a 7-point Likert scale. The final section of the survey collected student demographic data (gender, age range, year of study, faculty, mode of study, primary area of residence, and quality of home computing).

3. RESULTS AND DISCUSSION

This section commences by describing students' general attitudes towards technology, students' use, and perception of the usefulness, of specific technologies, and then the results of their perceptions of benefits, costs, and overall value are reported and discussed.

3.1 Attitudes Toward Technology

Students were very positive in their attitudes to using technology, despite having a considerably lower level of interest in it and, in many cases, a less than trouble free experience in using it (**Error! Reference source not found.**). Information technology has clearly passed into the realm of being another tool for almost every student to use, and is no longer seen as the province of nerds.

Table 1. Attitudes towards technology use

	Try to use technology in study	Don't avoid technology in general	Have an interest in technology	Don't have trouble with university technology
Mean*	5.91	6.10	4.95	4.90
Std. Deviation	1.08	1.47	1.61	1.50

* Based on a scale from 1, strongly disagree to 7, strongly agree

Students were less positive in their attitude towards communication via technology, in particular with regard to using email to build relationships with instructors, and their overall attitude towards learning online was only just better than neutral (Table 2).

Table 2. Communicating via technology

	I feel just as close to staff when we communicate via email as I do in face-to-face classes	Technology enables me to get prompt responses to my questions / problems	I do not find email impersonal	Using technology does not take away my sense of belonging to the university community	I like learning online
Mean*	4.04	5.09	4.85	4.93	4.54
Std. Deviation	1.67	1.42	1.51	1.64	1.63

* Based on a scale from 1, strongly disagree to 7, strongly agree

3.2 Use and Usefulness of Individual Technologies

Students had made extensive use of the available technology, which included the online learning environment, Blackboard; online access to many of the resources of the university library, including textbooks, databases and journals; email; and Turnitin, an online system that helps students to identify sections of written assignments whose original source should be referenced. Table 3 shows students' level of use, and assessment of the usefulness of, these technologies to support their studies. Blackboard and email are clearly highly valued by students, and the patterns of value and use are very similar. Online library facilities were less widely used, but nevertheless were highly valued. Turnitin has been regarded with suspicion by students; many see it as primarily a tool for use by staff to detect plagiarism, fear they may accidentally offend, resent being "assumed guilty unless proved innocent by Turnitin", and fear that their

copyright entitlements may be infringed. Extensive education efforts by staff have not been successful in laying these fears to rest, and so it is not surprising that so many students were negative about its usefulness. Further aspects of Turnitin use are reported below.

Table 3. Use and value of individual technologies

	Used the technology*		Found the technology useful[†]	
	Mean	Std. Deviation	Mean	Std. Deviation
Blackboard (online learning environment)	6.39	.90	6.35	.89
Email	5.79	1.38	6.09	1.28
Online Library	5.26	1.42	5.80	1.46
Turnitin (a referencing aid)	4.22	1.57	3.53	1.94

*Based on a scale from 1, never to 7, frequently;   [†]Based on a scale from 1, no value, to 7, extremely valuable

Because of its importance to academic integrity, and students' responses noted above, we were interested in further investigation of Turnitin. Table 3 shows that the responses for Turnitin use were dispersed (standard deviation of 1.60). Investigation of frequencies showed that 30% of students indicated little or no use of Turnitin while 26% assigned intermediate use and 44% considerable or extensive use. The Pearson bivariate correlation coefficient (.54, $p<.000$) shows that Turnitin usefulness is highly related to Turnitin use, suggesting that as students develop skills in using the online tool, they appreciate its usefulness more. Use of Turnitin is mandatory, so students are using it because they have to, not necessarily because they find it useful. We further investigated Turnitin usefulness using oneway analyses of variance, with the usefulness of Turnitin as the dependent variable and the student demographic variables (gender, age range, year of study, faculty, mode of study, area of residence, and quality of home computing) in turn as independent, grouping variables. The results show that students' views on the usefulness of Turnitin vary with year level ($F (4, 263)$ $= 6.82$, $p<.000$). The mean value for usefulness was highest for first year students (4.49), lower for second and third year (3.58 and 3.70) and lowest for fourth years (2.69). This general decline in perceived usefulness of Turnitin with advancing year level is possibly due to students' growing confidence in referencing skills, but it could also be a residue of bad experiences remembered by more senior students from the early years of Turnitin adoption by the University. These results suggest it is important to ensure that students are given adequate training and support in early stages of their study, and the need to implement new technology use well. There was no significant variance in Turnitin usefulness with other demographics.

Oneway analyses of variance with the usefulness of the remaining technologies as the dependent variable and the student demographic variables in turn as independent, grouping, variables revealed only one further demographic dependency. Students' views on the usefulness of online library resources varied with gender ($F(2,271) = 4.30$, $p<.014$). The mean value for usefulness was highest for female students (6.0) and lower for males (5.5). Data on demographics of library use are not available, so it is not clear whether this reflects different levels of library use between male and female students, or a greater need for remote access on the part of women.

3.3 Benefits of Technology Use

As stated above, value is determined essentially by cognitive assessments of benefits versus sacrifices. Thus we were very interested in establishing these factors. Our focus groups provided guidance and we used four emergent topics for further investigation. Table 4 provides students' responses to these topics. While all four areas were scored quite highly by students, there was relatively little difference between the overall scores (range of 4.81-5.20). Thus it appears, at this point, that technology serves multiple purposes for students.

Table 4. Benefits of technology use

		Mean*	Std. Deviation
1.	Being able to say that I have used technology extensively in my program will make me attractive to employers.	5.20	1.38
2.	The University's online teaching services really benefit me in terms of information provision	4.91	1.40

	Mean	Std. Deviation
3. The University's online teaching services (e.g. practice tests, quizzes, discussion groups) really benefit me in terms of learning support	4.92	1.54
4. Generally, using online teaching resources leads to a higher quality education	4.81	1.42

* Based on a scale from 1, strongly disagree to 7, strongly agree

To explore the characteristics of student groups that differed from each other in their degree of value for each of the above technology benefits, we conducted oneway analyses of variance, with the benefits listed in Table 4 as dependent variables and each of the demographic variables (gender, age range, year of study, faculty, mode of study, area of residence, and quality of home computing) as independent, grouping variables. The only significant effect from the demographics emerged with respect to year of study. It was significant for each of the four benefits shown in Table 4**Error! Reference source not found.**, demonstrated by all F values greater than 3.2 and all p values less than .05. For every benefit, the value is highest for students in their first year of study, declining for students in successively higher years and lowest for students in their fourth year of study. Further work will be required to establish why this is so; possible reasons include the effect of smaller class sizes in later years of study, the greater independence and confidence that students develop during the course of their studies, or perhaps the increasing expertise of staff in using online systems resulting in more positive experiences for the newer students compared to the experiences accumulated over time by the more senior students.

3.4 Why Online is Beneficial

Having established that students value technology because of its contribution to employment, information provision and learning support (Table 4 above), we further investigated some of the commonly proposed reasons why that might be the case. The mean values for online benefits are shown in Table 5 and indicate a surprisingly neutral attitude on the part of students; however standard deviations ranging from 1.66 to 1.85 indicate highly dispersed responses. To investigate this further, oneway analyses of variance were conducted, using the benefits of technology use (Table 5) as dependent variables and each of the demographic variables (gender, age range, year of study, faculty, mode of study, area of residence, and quality of home computing) in turn as independent variables.

Gender was significant in Item 3 of Table 5 (online enables choice of time of study), where males reported a higher mean value (3.9) than females (3.35), $F(2, 267) = 3.00$ (p<.05), and for Item 4 (online enables choice in place of study), where males again reported a higher mean value (3.96) than females (3.29), $F(2, 267)=4.82$ (p<.01). This greater enthusiasm from women than from men for the greater flexibility enabled by online provision of resources is consistent with the researchers' expectation that women are more likely than men to be fitting in study around other commitments, and may also be less willing than men to travel long distances or after dark.

The other demographic factors did not demonstrate a significant difference in any of the dependent variables. It is interesting that year of study was not correlated here – perhaps students no longer remember what life was like without the online services.

Table 5. Why online is beneficial

	Mean*	Std. Deviation
1. Using the University's online services enables me to choose *what* study activity I want to do at a particular time	3.62	1.73
2. Using the University's online services gives me more control over *how* I go about my study	3.53	1.66
3. Using the University's online services enables me to do my study *when* I want to (or am able to) do it, that is, at the time of my choice	3.57	1.85
4. Using the University's online services gives me much more choice about *where* I will do my study activities	3.55	1.83

* Based on a scale from 1, often; to 7, never

3.5 Sacrifices When Using Online Delivery

Students were asked to assess a number of potential sacrifices, as shown in **Error! Reference source not found.**.

Table 6. Sacrifices when using online delivery

	Mean*	Std. Deviation
1. It is difficult to learn how to use the University's online services	2.93	1.38
2. Online teaching is lower quality than face-to-face	4.43	1.61
3. Face-to-face discussions are quicker and more vibrant than online	5.15	1.60
4. Online interactions do not help me build professional networks for the future	4.27	1.61
5. Online learning removes the opportunity for social interactions and relationships	4.99	1.57
6. Online learning requires a great deal of self-discipline	5.11	1.61
7. Overall, I believe that the sacrifices involved in using the University's online learning services are high	4.03	1.43

* Based on a scale from 1, strongly disagree, to 7, strongly agree

While the average response for "overall sacrifices" (Table 6, Item 7) is mid-range, Items 3, 5 and 6 highlight the responsiveness and social benefits that students perceive they lose, and some difficulties with maintaining focus on their studies. This agrees with previous studies that suggest a need to foster positive engagement with e-learning and that attempts must be made to reduce the potential sense of isolation. It should be noted, however, that some focus group participants suggested that they feel more confident and more inclined to contribute to online discussions than they do in face-to-face situations. Additionally, the overall score for sacrifices (Item 7) indicates a need for caution in introducing new technology, and that we need to work to ensure that its introduction does not cause real or perceived decreases in the value of our offerings to students and the community. Oneway analyses of variance, with the sacrifices involved in using technologies as the dependent variable and the student demographic variables in turn as independent, grouping, variables, revealed only one demographic dependency. Students' views on whether face-to-face interactions are quicker and more vibrant varied with faculty of study ($F(3,261) = 3.88$, $p<.010$). The mean value was highest for students from the Faculty of Science and IT (6.2) and lower for students from the Faculty of Business and Law (5.1). Reasons for this difference are unclear. Although the number of respondents from the Faculty of Health was too small for the result to be relied on, it is interesting to note that their mean response for this item was 4.3, which lends a modicum of additional support for differences between faculties.

3.6 The Overall Value of Technology

Overall, use of online technology is seen as adding considerable value to the university experience (Table 7). However, there is considerably less support, and a wide variation in opinion, for the proposition that students are benefiting financially. Students appear generally to believe that use of online technology reduces the university's costs, and that some of the 'savings' should be passed on to them.

Table 7: The overall value of technology

	Mean*	Std. Deviation
Overall the University's online learning services are very valuable to me	5.45	1.21
For the price I pay for my education, I think that the online learning services offered by the University represent a good deal	4.13	1.7

* Based on a scale from 1, strongly disagree to 7, strongly agree

Table 4 showed that the four aspects of online delivery and service that were investigated in the study were all quite important to students. A linear regression analysis was carried out to identify which of them were the most significant contributors to the overall perception of value. This showed that information provision is the only significant factor for this cohort. This finding is of some concern. It may stem from the tendency of most staff to use online as a distribution/delivery channel rather than taking advantage of the potential for enhancing learning support and quality in creative ways that, for instance, foster meaningful interaction between students, and give opportunities for deeper learning.

4. CONCLUSIONS

Our students are now taking it for granted that they will use technology in their studies, and see it as serving some useful functions, such as providing marketable skills and enhancing learning support. They indicated less support than expected for the convenience factors that are commonly believed to add value for students – such as the flexibility to study when, where, and how the student wishes. Our study highlighted the responsiveness and social benefits that students perceive they lose, and some difficulties with maintaining focus on their studies, when they choose online study options. Students were neutral as to whether they liked learning online; but they reported that they value educational technology highly as a vehicle for better information provision. It will take work and creativity on the part of technology developers and academic staff to move beyond mere information provision into the areas where we believe that greater value might lie – truly interactive, enjoyable, online engagement with instructors, fellow students and with the learning materials, as well as resources and activities that promote deep learning.

Our results show some variations related to student demographics. For instance, female students report some higher use and perceived benefits than males, all related to being able to access various resources remotely and/or flexibly. We also noted that more experienced students were less convinced of receiving benefits from using technology. This was true for a particular technology – our referencing aid, Turnitin, as well as generally for information provision, learning support mechanisms, and a possible competitive advantage in the job market. More senior students are also more sceptical about use of online resources leading to a higher quality of education. A difference between faculties was also noted – Science and IT students felt more strongly than others that face-to-face interactions were faster and more vibrant than online; further work would be required to determine the extent that this perception is discipline dependent.

The demographic differences, the low reported usefulness of the unpopular technology, Turnitin and the almost neutral response to "I like learning online" indicate that technology should not be seen as a solution to every problem. Potential new technology should be carefully evaluated in terms of the value it could add to the student experience, and its introduction should be well supported with both accurate information and user training.

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