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Effects of Media Richness on User Acceptance of Web 2.0 Technologies in Higher Education

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1. Introduction

Educators are increasingly developing numerous ways to use Web 2.0 technologies to facilitate teaching, learning and to keep up to date with trend. These technologies provide enhanced interactivity and allow greater amounts of information delivered via richer communication, hence gaining wide spread acceptance among educational community. However, less empirical research has been done examining their information carrying capacity or media richness and its impact on user acceptance, specifically within the educational realms. This chapter is focused on examining the impact of media richness on user acceptance of various Web 2.0 technologies. Here we present findings of an empirical study to examine the effects of media richness on user acceptance of three popular Web 2.0 technologies namely blog, podcast and Second Life (a 3-D multi-user virtual environment), within higher education. A theoretical model has been presented based on technology acceptance model (TAM) (Davis 1989) and media richness theory (Daft et al. 1984). Data were gathered using online surveys and structural model was validated using the PLS (partial least squares) approach. Findings suggest that media richness has significant impact on user acceptance of all three technologies under consideration. However, media richness of Second Life has the greatest impact on user acceptance as compared to that of blog and podcast. These results are consistent with previous studies of media richness which state that synchronous communication media are richer than asynchronous media. These results also highlight Second Life's media richness capabilities of allowing multiple cues, timely feedback, language variety and personal focus in order to support teaching and learning activities. In this chapter, we also highlight some implications of our research for educators and developers of Web 2.0 applications followed by some ideas for future research.

2. Web 2.0 Technologies

2.1 Blogs

Web-log (or blog) is a Web site that contains dated entries in reverse chronological order about a particular topic and usually has links to comments on specific postings (Answers.com 2009). A typical blog functions like an online journal and may contain text, images, or even search facilities and links to other blogs, Web pages, and media (Wikipedia

2009a). Blogging has received increased attention in both professional and academic circles as it becomes more prevalent (Pew Internet and American Life Project 2005; <http://www.pewinternet.org>). A number of studies have shown benefits of using blogs in academic settings. For example, Lin et al. noted that blogs successfully contributed to students' online engagement (Lin et al. 2006); Maag reported that students shared their learning experiences and expressed their thoughts to the instructor and peers through course blogs (Maag 2005). Dickey also reported that blogs sparked reflective learning and satisfaction (Dickey 2004). Similarly, Kerawalla et al. found that students enjoyed blogging and used it for community building, resource-consolidation, sharing ideas or as a personal journal (Kerawalla et al. 2008). Despite these benefits there are some conflicting results about effectiveness of blogs. For example, many blog sites were claimed to be abandoned soon after their creation (Arnold 2008); or found to be unproductive in terms of interactivity among students (Divitini et al. 2005). Since a number of communication channels can be used in blogs including text, graphics, videos and audio, it is important to know about information carrying capacity of blogs and its impact on user acceptance.

2.2 Podcasts

Podcast is a series of digital media (audio or video) files that is released periodically and made available over the Internet using the syndication feeds for playback on portable media players and personal computers (Wikipedia 2009b). Like blogs, several examples of educational podcasting are also available. For example, the Duke iPod first-year experience project, where iPods were used for course content dissemination, classroom recording, field recording, study support, and file storage and transfer (Belanger 2005). Podcasting is also known to be more flexible and effective than traditional use of Websites and printed handouts (Chan et al. 2005) or even text books or students' own notes (Evans 2007). It is also found that podcasts advanced learning and improved students' understanding of the lecture material (Bongey et al. 2006). Podcasts can be used for dissemination of knowledge, broadcasting news to staff and students, supplementing class materials, guest lecture presentations and as a marketing tool for attracting prospective students (Harris et al. 2008). Despite these benefits of educational podcasting, very little empirical research is available on the information carrying capacity of podcasts and its impact on user acceptance.

2.3 Second Life

Second Life is a 3-D multi-user virtual environment (MUVE) launched by Linden Lab in 2003. Second Life is a world solely created by its inhabitants, called 'residents'. Residents have the opportunities to create their digital proxies called 'avatars' and design their clothing, hair colour, dresses and even appearances (Coffman et al. 2007). Avatars can walk, run, or even fly in the virtual environment. They can converse with other avatars using text, images, gestures or even voice. Residents can move or 'teleport' from one location to another.

3-D MUVEs like Second Life offer a variety of potential benefits for educational use including: collaboration and communication, engagement, conducting activities in a risk-free environment, alternative space for instruction and tasks, and visualisation of difficult content (Eschenbrenner et al. 2009). Richter et al. have identified at least five different types of learner engagements that are possible in Second Life: experiential, diagnostic,

demonstrative, role-play and constructivist (Richter et al. 2007). Second Life has the potential to be a useful educational tool for teaching and learning by using a constructivist approach (Coffman et al. 2007), which is the theory of knowledge acquisition obtained through interactions and building upon own knowledge and which produces the highest type of learning according to Bloom (Cheal 2007). Following this approach, students can discover and create meaningful content and interactions (Stevens 2006). Teachers in higher education have found Second Life a convenient place to conduct online classes, conferences, presentations, and meetings with students (Richter et al. 2007). However, in order to explore the teaching and learning potential of Second Life, it is important to investigate about media richness of Second Life and its impact on user acceptance.

3. Media Richness Theory

Media richness theory (MRT), originally developed by Daft and Lengel, states that the communication efficiency between people is affected by the fitness of the media and the characteristics of the communication task (Daft & Lengel, 1986). The richness of media is based upon the following four criteria: (1) capacity for immediate feedback; (2) capacity of the medium to have a personal focus; (3) capacity to transmit multiple cues, and; (4) language variety (Daft, Lengel, & Trevino, 1987). Using these categories, Daft and Lengel consider face-to-face communication as the 'richest' mode of communication while text being the 'leanest'. They also include technologies such as telephone, email, postal letter, note, memo, flier, and bulletin along their spectrum of media richness. Several other researchers follow a similar approach to classify other media such as video, voice, pictures, and text (Rice, 1992; Schmitz & Fulk, 1991; Zmud, Lind, & Young, 1990). With regard to the characteristics of communication task, MRT states that the purpose of communication is to reduce uncertainty and equivocality in order to promote communication efficiency, where uncertainty is associated with the lack of information and equivocality is associated with negotiating meanings for ambiguous situations. Therefore, a rich medium should be able to transmit sufficient amount of correct information in order to reduce uncertainty and should be able to process rich information in order to reduce equivocality (Sun & Cheng, 2007). In this chapter, we try to examine the media richness of various Web 2.0 technologies including: blogs, podcasts and Second Life and its impact on user acceptance. We would also like to examine which technology offers the maximum information carrying capacity or being the richest.

4. Theory of Technology Acceptance

Investigation of technology acceptance by target users have received considerable attention from Information Systems researchers and practitioners and several theoretical models and frameworks have attempted to explain or predict a person's decision to accept a new technology (Chakraborty et al. 2008). Of particular importance is the Technology Acceptance Model (TAM), a widely used model originally developed by Davis and his colleagues (Davis et al. 1989) to explain or predict individuals' acceptance of computer-based systems in various scenarios and organisational contexts (Chakraborty et al. 2008). TAM posits that user perceptions of usefulness and ease-of-use determine attitudes toward using the system or technology. An individual's attitude is hypothesised to influence the behavioural

intention to use a technology, which in turn leads to actual use. In the follow-up studies of TAM, the attitude component was dropped and perceived technology characteristics directly influenced the individual's intention to use the technology (Venkatesh et al. 2000). TAM has been considered as being robust and parsimonious for predicting user acceptance of a variety of new technologies (Raaij et al. 2008) and has been validated for a variety of new technologies including word processors, e-mail, spread-sheets, Web-based learning systems, and multimedia learning systems (Halawi et al. 2007; Lederer et al. 2000; Saade et al. 2007). In this chapter, we aim to examine the impact of media richness on user acceptance of various Web 2.0 technologies including: blogs, podcasts and Second Life. To do this methodologically we need to build a conceptual model and test several hypotheses and gauge the outcome which will be dealt in the next section.

5. Hypotheses and Model

Perceived usefulness and perceived ease-of-use are the basic TAM constructs. In general, perceived usefulness reflects an individual's subjective estimation of the job performance enhancement that is likely to result from the use of a new technology, whereas perceived ease-of-use refers to the degree to which he or she expects the use of the technology to be free of effort (Davis et al. 1989). Both of these constructs constitute a significant influence on an individual's intention to use a technology or system (Ma et al. 2004). We follow this trend and hypothesise the following:

H1. The perceived usefulness (PU) of blog, podcast and Second Life will have a positive impact on behavioural intention (BI) to use these technologies.

H2. The perceived ease-of-use (PEU) of blog, podcast and Second Life will have a positive impact on behavioural intention (BI) to use these technologies.

H3. The perceived ease-of-use (PEU) of blog, podcast and Second Life will have a positive impact on perceived usefulness (PU) of these technologies.

As media richness is referred as the information carrying capacity of a medium or its ability to facilitate shared meaning and understanding (Daft et al. 1984), it can be assumed that media richness will have a positive impact on people's intention to use a technology and that the more the media is rich the more they will find it easy-to-use. We thus hypothesise the following:

H4. The perceived media richness (PMR) of blog, podcast and Second Life will have a positive impact on behavioural intention (BI) to use these technologies.

H5. The perceived media richness (PMR) of blog, podcast and Second Life will have a positive impact on perceived ease-of-use (PEU) of these technologies.

Based on the above hypotheses an extended TAM is presented including perceived media richness, as shown in Figure 1.

Fig. 1. An extended TAM for Web 2.0 technologies including perceived media richness

6. Participants and Data Collection

To test the model in Figure 1 and validate the hypotheses we needed to carry out a study to examine user acceptance of Web 2.0 technologies within the educational context. Ideally, our respondents should include academic-centric participants who either had attended, designed or have been involved in some form of educational activities using blogs, podcasts and Second Life. To achieve this, an online survey was developed and participants were invited to take part in the survey using a number of possible venues including educators and researchers mailing lists, personal invitations to educational groups and advertising within Second Life. Some recent studies have adopted the similar approaches in exploring Web 2.0 technologies in the education context (Alvarez 2006; Boostrom 2008; Richter et al. 2007). The total number of valid responses obtained from the above mentioned resources was 122, which sufficed to perform the PLS analyses.

Multiple items were adopted from previously published scales for the constructs used in our model (Figure 1). The scales for perceived usefulness (PU) and perceived ease-of-use (PEU) were adopted from Davis et al. (Davis et al. 1989) including six items (PU 1-6) and four items (PEU 1-4) respectively. The scales for behavioural intention (BI) were adopted from Venkatesh et al. (Venkatesh et al. 2003) including three items (BI 1-3). The scales for perceived media richness (PMR) were adopted from (Carlson & Zmud, 1999) including four items (PMR 1-4). All above items were measured on a seven point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The complete questionnaire detailing above mentioned items is available in the Appendix.

7. Results

The PLS approach was used to assess both the measurement and the proposed structural model, using PLS Graph 3.0 software. PLS is a variance based latent variable structural equation modelling technique, which uses an estimation approach that places minimal demands on sample size and residual distributions (Chin 1998b). Previous research shows that PLS approach is more suitable for prediction as compared to other approaches like LISREL and EQs, because it assumes that all the measured variance in the study will be explained (Saade et al. 2005). The PLS approach has been used in several other studies of technology acceptance (see (Raaij et al. 2008), (Saade et al. 2005), (Mun et al. 2003)), thus deemed suitable for our study. After ensuring the validity and reliability of the scales, we tested the hypothesised relationships between TAM and the media richness constructs. We conducted tests of significance for all the paths using the bootstrap re-sampling method (Cotterman et al. 1992).

7.1 Demographics

Our sample included 79 females and 43 males. The mean age of participants was 42, ranging from 17-65 years. Teachers (27%) and students (25%) constituted the larger groups while researchers (13%) constituted the smallest group. The majority of participants appeared well educated as 67.2% of them held postgraduate qualifications. The survey results also showed that 82.8% of participants had Internet experience of more than 9 years. In addition, 66% of participants had more than 6 months of experience in using blogs while 50% had the similar experience in using podcasts. For Second Life, 81.9% had at least 6 months experience. These results suggest that our participants were of mature age and well educated. They had extensive experience of using Internet and adequate experience of using blogs, podcasts and Second Life in the academia. Thus they fit well into our target participants' profile.

7.2 Data validation and reliability

Table 1 presents the summary of all measurement scales including factor loadings, t-values, composite reliability and average variance extracted (AVE). The factor loadings provide the evidence for convergent validity as all constructs load greater than the threshold of 0.60 as suggested by Chin (Chin 1998a). The t-values derived from our analysis also provide the evidence for convergent validity since all values exceed the threshold of 1.96 as suggested by Gefen and Straub (Gefen et al. 2005). Internal consistency also appears significant for all of our constructs since the composite reliability values exceed the minimum of 0.70 as suggested by Nunnally and Bernstein (Nunnally et al. 1994).

Discriminant validity was met using the Fornell and Larcker test (Fornell et al. 1981). The procedure involves computing the square root of the AVE of each construct, which should exceed the correlation shared between the construct and other constructs in the model. Table 2 shows that the square roots (in bold) of all AVEs (on the diagonal) are greater than the cross-correlations of all other constructs. Thus all our constructs demonstrate a good degree of validity and reliability.

	Construct Items	Factor Loadings	t-values	Composite Reliability	AVE
Blog	PU (1-6)	.67-.81	15.31-27.17	.87	.59
	PEU (1-4)	.64-.74	6.93-11.34	.76	.51
	PMR(1-4)	.76-.82	14.61-31.28	.88	.65
	BI (1-3)	.82-.85	19.87-29.80	.87	.69
Podcast	PU (1-6)	.71-.84	11.78-39.90	.90	.59
	PEU (1-4)	.63-.80	7.03-33.49	.81	.51
	PMR(1-4)	.76-.81	17.16-22.10	.88	.64
	BI (1-3)	.82-.85	20.63-37.48	.88	.71
Second Life	PU (1-6)	.68-.86	9.43-35.64	.90	.59
	PEU (1-4)	.60-.89	3.0-16.04	.70	.50
	PMR(1-4)	.74-.82	11.84-18.11	.87	.63
	BI (1-3)	.89-.94	28.51-49.84	.94	.83

Table 1. Construct reliability measures

		PU	PEU	PMR	BI
Blog	PU	.77			
	PEU	.45	.71		
	PMR	.52	.34	.81	
	BI	.56	.38	.55	.83
Podcast	PU	.77			
	PEU	.54	.71		
	PMR	.51	.32	.80	
	BI	.55	.46	.46	.84
Second Life	PU	.77			
	PEU	.42	.71		
	PMR	.58	.36	.79	
	BI	.41	.14	.52	.91

Table 2. Discriminant validity of constructs

7.3 Hypotheses and Model Testing

The proposed hypotheses and structural model are evaluated by examining the significance of path coefficients and the variance explained by the dependant constructs. Table 3 summarises the results of hypotheses testing and variance explained (R²) by the dependant variables (behavioural intention to use blog, podcast and Second Life). The path coefficient values provide support for hypothesis H1 as the relationships between PU and BI appear significant for all three technologies. Hypothesis H2 is not significant (n.s.) for blogs and Second Life but appear significant in the case of podcast. However this is consistent with the previous studies of TAM. Hypotheses H3, H4 and H5 appear significant for all three technologies. Table 3 also shows the variance explained (R²) by the original TAM as well the extended TAM, i.e., TAM including perceived media richness. The original TAM explains 32% of the users’ intentions to use blogs while the extended TAM explains 41% of users’ intentions to use blog, thus showing an overall improvement of 9 percent. Similarly, the extended TAM shows an overall improvement of 4% and 12% for podcast and Second Life respectively. Thus the media richness has the strongest impact on users’ intention to use

Second Life. These results are further verified by comparing the path coefficient values of relationships $PMR \rightarrow BI$ and $PMR \rightarrow PEU$ for Second Life with those of blogs and podcasts.

	Blog	Podcast	Second Life
PU→ BI	4.31***	2.96**	2.0*
PEU→ BI	1.48 (n.s.)	2.06*	1.0 (n.s.)
PEU→ PU	6.43***	9.61***	5.63***
PMR→ BI	4.20***	2.56**	4.61***
PMR→ PEU	4.20***	3.88***	4.75***
Variance explained (R ²) by the original TAM	.32	.34	.18
Variance explained (R ²) by the extended TAM	.41	.38	.30
Overall Improvement (%age)	9%	4%	12%

Table 3. Hypotheses testing and variance explained by the original TAM and extended TAM.
* Path coefficient significant at the 0.5 level; ** at the 0.1 level; *** at the 0.001 level.

7.4 Analyses of Results

Several insightful results can be summarised from the above findings. First of all, the original TAM holds true for all three technologies (blog, podcast and Second Life) under consideration, except the insignificant relationship between perceived ease-of-use and behavioural intention. However this is consistent with the previous studies of TAM. For example, Davis observed that when users learn to effectively use the system, the direct effect of ease-of-use on the system use disappears (Davis 1989) while Raaij and Schepers suggested that the actual use of system can be influenced more by the perceived usefulness as compared to the perceived ease-of-use, as users are willing to overcome the usability hurdles of system’s environment in favour of the prospect of better academic outcomes (Raaij et al. 2008). It can also be noted that the original TAM explains only 18% of the users’ intentions to use Second Life, which suggests that the traditional approaches may not be able to explain the usage of today’s highly interactive, multi-user and entertainment-oriented technologies like MUVes or multiplayer online games. Similar concerns are echoed by (Heijden 2004), (Holsapple et al. 2007) and (Hsu et al. 2004). These results further suggest the need to explore other facets of human behaviour in order to better explain usage of emerging Web technologies.

Second, perceived media richness shows a highly significant impact on the users’ intentions to use all three technologies, which suggests that the more the medium is rich the more the users perceive it easy-to-use and finally use it. However, this impact is the strongest in the case of Second Life followed by blogs and podcasts, which suggests that Second Life is a

very rich medium in its capacity to provide immediate feedback, to have a personal focus, to transfer multiple cues, and to offer language variety. In line with some previous studies (Kishi 2008; Newberry 2001), our findings confirm that synchronous media like Second Life are richer than asynchronous media such as blogs or podcasts.

Third, it can also be seen from Table 3 that our proposed model (TAM with media richness) is able to better explain the usage or acceptance of blogs, podcasts and Second Life as compared to that of original TAM. However, this improvement is more significant in the case of Second Life as compared to blogs and podcasts. This suggests that Second Life offers a richer environment to interact among its users.

The findings discussed above have implications for both research and practice. First, the study contributes to the field of technology acceptance by advancing the significant effect of media richness on usage or acceptance of new technologies. Second, the study has implications for educators who wish to incorporate emerging Web technologies like blogs, podcasts and Second Life in their courses: they should employ pedagogical principles in the development of meaningful content to increase the usage of above technologies. The findings further suggest that Second Life can be used as an effective tool for content dissemination by educators and as a collaborative research activity among researchers as it offers a richer environment and a variety of communication channels.

8. Conclusion

Media richness is not new in predicting users' choice about new technology or categorising various technologies based on their richness. However the aim of this chapter is to examine the impact of media richness on user acceptance of three popular Web 2.0 technologies namely: blogs, podcasts and Second Life. A theoretical model is presented based on the theories of technology acceptance and media richness in order to examine the impact of media richness on user acceptance of above mentioned technologies. The proposed model is evaluated based on the data collected from an online survey. Findings suggest that media richness has a direct and positive significant impact on user acceptance of blogs, podcasts and Second Life. However there is a need to consider other behavioural factors in order to better explain usage of emerging Web technologies. They further suggest that Second Life is the richest medium among the three technologies under consideration thus deem suitable for educational and research activities.

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Appendix

Perceived Usefulness (PU)

PU1: Using blog / podcast / Second Life enables me to accomplish my tasks more quickly.

PU2: Using blog / podcast / Second Life improves my class or work performance.

PU3: Using blog / podcast / Second Life increases my productivity.

PU4: Using blog / podcast / Second Life makes it easier for me to understand lecture.

PU5: Using blog / podcast / Second Life makes it easier for me to communicate with lecturer/friends.

PU6: Overall, I find blog / podcast / Second Life useful in my study/work

Perceived Ease of Use (PEOU)

PEOU1: Learning to use blog / podcast / Second Life is easy for me.

PEOU2: I find it not difficult to get blog / podcast / Second Life to do what I want it to do.

PEOU3: I find blog / podcast / Second Life to be flexible to interact with.

PEOU4: It is easy for me to become skilful at using blog / podcast / Second Life.

Perceived Media Richness (PMR)

PMR1: Blog / podcast / Second Life allows me to give and receive timely feedback.

PMR2: Blog / podcast / Second Life allows me to tailor interaction according to my personal requirements.

PMR3: Blog / podcast / Second Life allows me to communicate a variety of different cues (such as emotional tone, attitude, or formality) during communication.

PMR-4: Blog / podcast / Second Life allows me to use rich and varied language during communication.

Behavioural Intention (BI)

BI1: Assuming I had access to blog / podcast / Second Life, I intend to use it.

BI2: Given that I had access to blog / podcast / Second Life, I predict that I would use it.

BI3: I will use blog / podcast / Second Life frequently in the future.

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The education industry has obviously been influenced by the Internet revolution. Teaching and learning methods have changed significantly since the coming of the Web and it is very likely they will keep evolving many years to come thanks to it. A good example of this changing reality is the spectacular development of e-Learning. In a more particular way, the Web 2.0 has offered to the teaching industry a set of tools and practices that are modifying the learning systems and knowledge transmission methods. Teachers and students can use these tools in a variety of ways aimed to the general purpose of promoting collaborative work. The editor would like to thank the authors, who have committed so much effort to the publication of this work. She is sure that this volume will certainly be of great help for students, teachers and researchers. This was, at least, the main aim of the authors.

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