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INFLUENCES ON CONTINUED USE OF AN INFORMATION SYSTEM: A LONGITUDINAL STUDY

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Abstract

What influences encourage and discourage long-term use of an Information System (IS)? In a longitudinal study over 14 months, we examine use of a Learning Management System in an educational setting. Our findings suggest that the influences that support users' decision to adopt a technology may not be sufficient to encourage continued long-term use. New influences emerge as users employ technology to suit varying needs in work environments at varying times. Findings from the study reveal that rejection of a technology may take place long after adoption if users do not experience long-term benefits or are unable to resolve persistent issues. Localized IT and peer-support and on-going training are key factors in encouraging users to persist, resulting in long-term productivity and satisfaction.

Keywords: Technology appropriation, adoption, influences, long-term use, support, on-going training

1 INTRODUCTION

Technologies are introduced in organizations to enable individuals and the organization as a whole to achieve productive outcomes. This requires effective long-term use, persisting well after the initial adoption of the technology. However, facilitating effective long-term use has been a daunting task among managers, information systems professionals and researchers. Information system research has long focussed on technology adoption and acceptance of a technology, yielding numerous models of user acceptance using a variance approach (Agarwal and Prasad 1999; Compeau, Meister and Higgins 2007, Venkatesh, Morris, Davis and Davis 2003; Karahanna, Straub and Chervany 1999; Rogers 1995; Davis 1989). Yet, little is known about the process of how and why users adopt and then continue using a technology over time and their changing needs, expectations and influences that may encourage or discourage long-term use.

We define technology appropriation as: "*the way that users evaluate and adopt, adapt and integrate a technology into their everyday practices*" (Carroll, Howard, Peck and Murphy 2003). This paper is one in a series of papers that represent the findings of an ongoing research program focussed on understanding the process of appropriation and the influences on individual's long-term use of Information and Communication Technologies (ICT's) in an educational environment (Mendoza et al. 2007). In a longitudinal study over 14 months, our initial study examined the process of appropriation by users of an ICT namely the Learning Management System in an educational setting (Mendoza et al. 2007). Our previous findings suggested that the process of appropriation was incremental over time. Multiple plateaus of temporary stabilization were shown to occur during longer term use of a technology. In addition, findings from the previous study revealed that rejection of a technology may take place long after adoption.

In this paper we extend our prior work by refining our understanding of the influences on productive and long-term use of an ICT in an educational setting. The underlying question addressed in this paper is: *What are the influences that encourage and discourage continued use of a technology in an educational environment?*

We begin with the theories relating to the process of technology adoption and use, followed by the research methodology. The research findings are presented and their implications are discussed. The paper concludes by presenting some avenues for future research.

2 THEORETICAL BACKGROUND

Adoption and acceptance of a technology has long been an important topic for information systems researchers (Davis 1989; Moore and Benbasat 1991; Thompson, Higgins and Howell 1991; Venkatesh et al. 2003). The Technology Acceptance Model (TAM) has made important contributions in predicting technology adoption and use. According to this model, the behavioural intention to use a system is determined by perceived usefulness and perceived ease of use (Davis 1989). In addition, TAM also suggests that perceived ease of use may be a causal antecedent to perceived usefulness. Recent studies have revised TAM (Venkatesh et al. 2003) by including social influences and key moderators. While a significant body of work has been focussed on TAM in predicting use, there has been little research into the dynamic nature of technology use once it is adopted and infused into work practices (Mendoza et. al 2005; Carroll et al. 2003).

As users adapt and re-invent the technology to suit their needs, their expectations, needs, likes and dislikes change with time (Mendoza et. al 2005, 2007; Orlikowski 2000; Majchrzak, Rice, Malhotra and King 2000). Users, through recurrent interaction with the technology, ignore certain properties of the technology or invent new properties and attain "*stabilization-for-now*" (Orlikowski and Iacono 2001). A technology that is introduced into a work place (technology as designed) is thus changed over time. This changed technology (technology in use) is an outcome of the process of appropriation,

which involves users trialling, evaluating and adapting the technology to suit their personal needs based on their perceptions and various rein-forcers. Some prior studies have drawn attention to understanding continued use in contrast with initial use or acceptance, focussing on the differences between acceptance and post-adoptive use behaviour (Jasperson, Carter and Zmud 2005; Bhattacharjee 2001; Carroll et. al. 2003; Karahanna et al. 1999). However, little is known about how and why users either extend or limit their use of a technology (Compeau et. al. 2007) and sometimes reject a technology.

Facilitating productive and satisfactory use of a technology, well after adoption, remains a concern for managers and professionals. One important issue relevant to productive long-term use is training. In recent years, most IT training has focussed on refining formal training content and methods (Gallivan, Spitler and Koufaris 2005). Little is know about when and how to make training more relevant and what other support mechanism may help users continue using a technology over time. It is therefore necessary that longitudinal studies be conducted to better understand the influences that encourage and discourage continued use of different technologies used by different cohorts in different environments.

3 RESEARCH METHODS

This research investigates the influences that encourage and discourage productive and long-term use of an ICT in an educational setting. A longitudinal field study was conducted at a large university. The technology selected was called the Learning Management System (LMS). Although the LMS has been studied in different domains in the educational environment (Benson and Palaskas 2006), we chose it as it was an entirely new information system introduced by the university to support teaching and learning among staff and students. After pilot studies in 2005, a rollout plan for 2006 and 2007 was set in place by the university, where all subjects would go active on the LMS and all staff would be faced with the decision to adopt and use the technology. Centralized training courses were set in place by the university, to aid academic staff interested in learning to use the LMS. The research was undertaken between January 2006 and March 2007 at the University of Melbourne.

Twenty three participants (7 female and 16 male) agreed to participate in the study. They were recruited by the first researcher from training courses run by the university. None of the participants had prior experience with the LMS. However, 15 out of the 23 participants had used technology-based learning systems such as WEBRAFT (9) or had developed their own web pages as a communication tool in their teaching practice (6 participants).

The research used a multi-method research design which included interviews, focus groups, participant observations and scrap books; the design is similar to that of the first research project (Mendoza et al. 2005, 2007). Using multiple methods allowed us to triangulate data (Lee 1991) on participants' perceptions and actual experiences with the technology during continued use. The scrap book was used as an expressive channel for adding a different view on participant's perceptions only in the first 2 months of use. With time, not all 23 participants used the scrap book even though attempts were made to remind them.

Participants were studied from their initial encounter with the LMS after training (1-2 weeks) through to 44 weeks of use. Data were collected at the initial encounter with the technology and 7 subsequent times over the following 44 weeks, as shown in Table 1.

Not all of the 23 participants were available to be interviewed and observed at every time point but attempts were made to follow up on all participants. Some of the participants were not using it and some could not be interviewed in semester of 2006. This is reflected in Table 1 with the drop in the number of participants in later weeks.

Interviews and focus groups were audio-recorded with the consent of the participants. In addition, field notes at interviews and observations were made by the first-named researcher. All data were coded. Descriptive codes were used to generate general and specific themes. Diagrams and a time

ordered matrix were also used to display, analyze and refine the themes from the data collected during different times in the research (Miles and Hubermann 1994; Langley 1999).

Time-line	No. of participants	Techniques	Issues explored
1 – 2 weeks	23	Interview	<ul style="list-style-type: none"> • Attitude and expectations during their initial encounter. • Post hoc recollection of reasons for attending training and the decision to adopt technology
3 – 4 weeks	Three groups of 3, 4 and 2 14	Focus group + scrap book Interview + scrap book	<ul style="list-style-type: none"> • Users' experiences and expectations while using the technology. • Likes and dislikes about the technology
7 – 8 weeks	22	Participant observation + scrap book	<ul style="list-style-type: none"> • Role of the technology in users' teaching practices. • Experience with the 'look and feel' of the interface. • Features used to suit their needs. • Reasons for selecting to use specific features.
16 – 20 weeks	22	Follow-up interview + participant observation + scrap book	<ul style="list-style-type: none"> • Changing expectations, experiences and needs of participants. • Likes and dislikes about the technology and its features. • Reasons for continued use of the technology. • Factors that encourage or discourage continued use.
24 weeks	22	Follow-up interview + Participant observation + scrap book	<ul style="list-style-type: none"> • Changing expectations, experiences and needs of participants. • Likes and dislikes about the technology and its features. • Reasons for continued use of the technology. • Factors that encourage or discourage continued use.
32 weeks	8	Follow-up interview + scrap book	
36 weeks	6	Follow-up interview + scrap book	
44 weeks	11	Follow-up interview	

Table 1: Data collection timelines, number of participants, techniques and issues explored

4 RESEARCH RESULTS

In this section we report our findings on the influences that encourage and discourage continued use of the LMS at different time periods. The data has been organised according to the themes identified within the varying time periods of data collection.

4.1 Training and decision to adopt

Participants attended a centralized classroom-based training program, organized by the University, on how to use the LMS. Most participants perceived that it was a requirement by the university that they adopt the technology, "...with the teaching today, there is a requirement to have some sort of online contact with your students...whatever decision the University makes in terms of channel to teach, you have to use it". Some of them perceived that they had no choice but adopt and use the LMS because their prior practices may not be supported in the future, "WEBRAFT will be phased out at some point and the LMS will be the one we use".

Some participants (5) attended training due to their perceptions, "...that the students have an expectation that there be an online contact". For others, it was an expectation from peers in the department to want them to use the LMS, "We were strongly encouraged in the department to go put our hands up". This is similar to subjective norm defined as a person's perception that most people that are important to him/her think that he/she should or should not perform the behaviour in question (Davis 1989; Venkatesh et al. 2003). A special case of subjective norm namely the authoritative role held by some of the participants (4) influenced the decision to adopt the technology. For example one participant commented "I did, not so much because I desperately wanted to use the system...but more

in my role of a member of [committee] and also being the Associate Dean...I felt the sort of responsibility of understanding the system...how we could use it effectively”.

In addition to subjective norm, all participants expected the LMS to be useful in their teaching practice as a communication tool for staff and students, *“For communication for students and staff and I’m thinking that is going to be very useful”*. They also perceived that some of the features provided by the LMS would be useful, *“...it will be student’s entry point and will make use of a couple of features that I like, the discussion forum and the announcement system”*. This is similar to expected usefulness defined as the degree to which a person expects that using a particular system would enhance his or her job performance (adapted from Davis 1989).

Participants also expected the LMS to be easy to use, *“I’m hoping that it’s simple and easy to use for me and students”*. This is similar to expected ease of use defined as the degree to which a person believes that using a particular system would be free of effort (adapted from Davis 1989).

It was also noted that participants perceived that using the LMS would be better than their prior technology WEBRAFT. One of them commented: *“I’ve had a go at WEBRAFT and Dream Weaver but I’ve left them very quickly because they didn’t seem to have the potential to be useful, I’m more patient with this [LMS] because I can see potential”*. This is similar to relative advantage, the degree to which adopting or using the information technology is perceived as being better than using the practice it supersedes (adapted from Rogers 1995).

Two other influences that encouraged participants in the decision to adopt the technology were expected integration with other software within the LMS environment and the need to enhance their professionalism. Participants expected to be able to link self-developed applications from within the LMS, *“I’m using the project which I’m very enthusiastic about, film clips on the web and online exercises for listening comprehension to put pressure on myself to use the LMS”*. Some of the participants (8) expressed the need to change or enhance some of their teaching methods using the LMS, *“...there should be an internet presence and it’s not right that we hadn’t one for so long”* and *expected the LMS to provide a professional environment for communicating with students...“.*

4.2 Influences over varying time periods

There was number of influences that encouraged participants to explore, and continue using the technology from weeks 1-2 until 44 weeks. In the short term, usefulness, ease of use and subjective norm were noted as strong influences that encouraged continued use of the LMS. However, in the long term, usefulness and the ability to contact trainers, IT-support staff and peers were noted by participants as a powerful influence that encouraged them to continue using the LMS over time. The lack of usefulness, lack of ease of use, subjective norm and the inability to resolve problems were noted to discourage continued use of the technology by participants.

4.2.1 Adaptability

The ability to adapt the technology to suit one’s needs was noted as an influence that encouraged initial use (weeks 1-2 and 3-4). The LMS gave participants the flexibility to customize the interface, *“I like that it doesn’t dictate to me what I can put on the site, I can design, not just the look of the site but the content... the level of choice is terrific”*. It was interesting to note that the ability to adapt the LMS to suit their needs gave some participants a sense of control and feeling of ownership over the technology, *“I think it gives you control... getting our lectures loaded it was always going to another person, you then depended on them...so for me LMS is more ownership...”*.

4.2.2 Usefulness

Usefulness of the technology was noted to be a strong influence that encouraged participants to continue using the technology during the entire time period of the study. Initially in weeks 1 and 2 usefulness was expressed in terms of the technology as a whole, its features and the ability to access it

from anywhere. It was reported by participants that the LMS was useful because it was a good communication and time saving tool “...it will be useful because it also save me time in the long run”, where all information would be in one place for students to access, “...its useful everything is going to be in one spot”. For many participants, usefulness was observed in terms of the features it possessed. For some, the ability to make announcements and access student lists was useful. This is reflected in comments such as: “...things that come up in relation to notices and announcements ...it seems to me to be a very useful structure” or “...I think the capability of seeing the student lists, so who’s enrolled in the subject...”. A few participants expressed the convenience of using the LMS from home and office. For example, one of the participants commented, “The fact that you update it from outside the University... I’ve been doing it from home, that’s good”.

With time, participants expressed usefulness in terms of the ability to re-use information (observed in weeks 7- 8, 32 and 36). The ability to archive information for re-use was noted by them as a positive in the LMS, “All the stuff are on the Content Management System and with archiving some of the subjects don’t change that much....so I’m not designing anything next year as it’s all done”. In weeks 16-20, usefulness was also expressed by participants, in terms of the ability to share information and resources among others, “...the nice thing is if you are marking among 3-4 people we can tell them to straight away enter into the LMS...in the old method they had to do it on a spreadsheet and I had to get it all together”.

However, other participants perceived a lack of usefulness (in weeks 3-4, 7-8 and 16-20) as an influence that discouraged them from further adapting the LMS or even stopping them from using it. Five participants expressed frustration about not seeing any benefit in further adapting the LMS, “...where the system would be most useful for me is the grading, assessment... and what we require isn’t a part of this system...I don’t think it is all that useful”. The lack of a reward in using the LMS was one of reasons for four participants to stop using it (observed in weeks 7-8 and 16-20). This is reflected in comments such as: “...convince me that the LMS works, nobody did that...I don’t see a benefit in using the LMS” or “I’m not using it for my teaching, there is no reward for my investment in time to use it”. It was also observed (in weeks 7-8 and 16-20), that some participants expressed the lack of usefulness in terms of the inability to share information with the outside world. They commented that people outside the University were unable to access information on the LMS, “One issue that I had was that we have two external people acting as supervisors...I wanted to load them into the LMS to access the discussion and groups and I was told that we can’t do that...” .

4.2.3 Ease of use

In addition to usefulness, ease of use was noted as a strong influence that encouraged continued use of the technology.

Ease of use was noted as a positive influence in encouraging continued use of the LMS in weeks 1-2, 3-4 and 16-20, “I think it’s generally easy to use. I’m comfortable with navigating around and doing my configuring”. Some participants found it easy to deliver information with little or no effort compared to their with prior practices using WEBRAFT, “What I do like is the ease with which one can add files or documents ...where as previously with WEBRAFT...which was cumbersome... I think its strength in relation to WEBRAFT, it’s much more user friendly”.

However, perceptions of lack of ease of use discouraged some participants from continuing to use it. The lack of ease of using the LMS was expressed in terms of usability issues by participants in weeks 1-2 up to 44 weeks. Some participants found it difficult to juggle between screens “...I felt as though there were lots of going back and forth between the different pages...” and the options on the CONTROL_PANEL were not intuitive, “...that massive page with different menus [control panel] it was not an easy overview and you had to search through the item...so counter intuitive”. They also found that there were too many steps to follow to set up and use some of the features, “...there are too many steps...that is confusing for the first time user”. They also expressed their frustration with the number of clicks to the OK button expected of them by the LMS. For example one participant

commented: *“I just dislike any system that forces me to click OK buttons all the time”*. In addition, it was noted that participants expressed frustration in the lack of ease of re-using information due to usability issues, observed at 44 weeks, *“...wanted to archive the subject and I pushed the button...it had strange names, it was not what I expected...I don’t know how to re-use it.... there are so many areas in the LMS that are not explained and not clear and poorly defined in terms of usability”*.

It was also interesting to note at 24 weeks, the lack of ease of using some of the features in the LMS was a strong influence that led three participants to continue using their prior practice such as the WEBRAFT system in parallel with the LMS. For example one of the participants said *“It’s probably familiarity with WEBRAFT...it is easier and quicker...I could find the information quickly other than going to LMS, which is hard to find”*. In addition, two of the five participants who stopped using the LMS (observed in weeks 7-8 and 16-20) commented that they appreciated the idea of having the LMS as a communication tool but found it difficult to use it. For example one of the participants said, *“I don’t have an incentive to use it because I feel that it’s just a bit hard for me to use it...I had good intentions but it’s a poor execution...I like the idea, it is good to have it all in the central place...I have an aspiration to use it but I’m not using it for my teaching”*.

In addition, the lack of ease of learning to use the technology was also noted as a strong influence that discouraged participants from using the technology (noted in weeks 1-2 up to 24 weeks of use). One participant said, *“It’s not easy to learn to use... I really struggled...it was not taking me sensibly through the tasks...I have to keep going back to the manual... There are no prompts here to tell me”*. Participants expressed their frustration with the terminology and the number of steps they had to remember while learning to use the LMS, *“...its going to take me quite some time to get a map of it into my head and to understand...The fact that there’s confusing labels and many steps is kind of difficult”*. The manuals were useful as a reference initially, *“...one of the good things about the manual is, is that it shows you the screen you should be looking at and that’s always reassuring, but– I think you’d only need that for a short time”*. However, most participants did not find the manual helpful in adapting the technology in their teaching practices. They found it to be detailed, un-intuitive, *“...what it lacks is a flow chart...in a kind of constructive sense, I like to know where I am in a process and that’s what I don’t know”*. Some of them expressed frustration with the lack of an On-line help feature to guide them as they used the LMS, *“I need a help manual, that comes on-line with me... because people like me don’t have time[to look through the manual]...you’ve actually got to go page by page through a bunch of steps”*.

4.2.4 Problem solving and access to help

In addition to the influences such as usefulness and ease of use, the strongest influence noted to support continued use of the technology by participants was the ability to access help (observed in weeks 1-2, 7-8, 24 and 44).

The ability to contact trainers, IT-support staff and peers was expressed by participants as a strong influence for continued use of the technology, whenever they were faced with problems while using the LMS. This is reflected in comments such as, *“There’s an informal group of people in our department who are using LMS...telling new people like me things that we needed to know”* or *“I’ve had to get help...from [one of the trainers] of LMS and the IT person in our department was able to work out the problem I was having related to blank spaces after a URL...”*. With time, in weeks 7-8, 24 and 44, participants contacted their local IT support staff and peers to help support further exploration and adaptation to suit immediate needs, *“...academic IT support person has been very supportive and my colleague next door...because she has used it, if you go and ask her something, there is help readily available and we are not waiting for someone outside”*.

However, the inability to resolve problems was noted as a strong negative influence that discouraged continued use of the technology throughout the study (noted in weeks 3-4, 7-8, after 16, 24 and 44 weeks). Some participants expressed frustration in the inability to resolve problems while using the LMS and switched back and forth between their old practice and the LMS when faced with problems,

“I tend to post most things to LMS except when I can’t get that happening then I put it on WEBRAFT. All announcements I do on the LMS”. For four participants, the inability to resolve problems even after contacting the trainer or help desk support, had led them to avoid using some of the features or work around them, *“I actually wanted instant feedback from someone who knew the system ...I find that it is really frustrating there isn’t expertise to support us in using this [LMS]”*. It was also observed that the lack of IT and peer support to resolve problems, stopped one participant from using the LMS *“...We don’t have any support–technical assistant to help us...if there were a group of us in the department using it and would say “common let’s do it together” that might be better...I’m isolated and with a reasonable teaching workload it’s not happening”*. Some participants expressed frustration due to the inability in perceiving further use the technology (noted in 16-20 and 44 weeks use of the LMS). Some of them expressed the need to attend more training to learn to use additional features of the LMS, *“I feel if I had a 1 hour seminar on using some of the features then that will help me out”*. They also expected trainers and managers to update them with innovative and different new ideas of using the technology, *“I’d like to attend training and it would be good if they showed us what others have done with the LMS to get some creative ideas”*.

4.2.5 Minor influences

There were several less powerful influences that encouraged continued use of the technology. A couple of them were lack of time and subjective norm. Subjective norm was observed in weeks 3-4 and later in weeks 16-20. Participants commented that they would continue using the LMS because they perceived that students expected them to use it, *“...the students like it and they all seem very comfortable with it – that’s 80% of the battle to it – if the students are happy with it”*. Some participants perceived that the university expected them to improve their quality of teaching and it was important they use the LMS, *“Anybody who is going to have a teaching and performance review is going to be using LMS. So there is a compulsion”*. Interestingly, the lack of subjective norm was noted as a negative influence among some participants (6) in 3-4, 16-20 and at 24 weeks, *“Students are not using it...I checked the discussion forum and there was nothing”*. For some others, the lack of subjective norm was related to a negative-word of mouth that obstructed further use of the technology, *“I didn’t use the grade book...I got that mail from my colleague about the problems he had with it...the grade book would obviously been useful...except that it isn’t”*.

The lack of time was expressed as an influence that discouraged further adaptation and use of the technology. In weeks 7-8 and at 44 weeks, participants commented that they were busy with other activities in their teaching practices and did not have the time to further adapt the LMS, *“I don’t think I’m really using it to its full potential...primarily time is the reason”*.

The varying influences noted at different time periods in our study are summarized in Table 2.

5 DISCUSSION

In this study we have addressed the question: What are the influences that encourage and discourage continued long-term use of a technology in an educational environment? In identifying the influences at varying time periods of technology use, we extend our understanding of the influences that encourage and discourage continued use of a technology. Based on the influences shown in Table 2, important findings are summarized in Figure 1, linking the process and the major influences that encourage and discourage long-term use of an Information system.

With respect to the decision to adopt a technology, apart from users perceiving use of the technology as mandatory, we found influences such as expected usefulness, expected ease of use (adapted from Davis 1989; Venkatesh et al. 2003), relative advantage (Moore and Benbasat 1991; Rogers 1995) and subjective norm (Davis 1989) encouraged users’ decision to adopt the LMS. Further, we found that subjective norm may not be simply a person’s perception that most people that are important to him/her think that he/she should or should not use a technology. It may also be expressed in terms of

the authoritative role held by users in their own work practices that drive them to adopt a technology. In addition, our study reveals that the need for enhancing professionalism and changing existing practices by users may influence the decision to adopt a technology.

Influences	Decision to adopt	1 - 2 wks	3 - 4 wks	7 - 8 wks	16 - 20 wks	at 24 wks	at 32 & 36 wks	at 44 wks
Expected usefulness	Usefulness	Usefulness	Usefulness	Usefulness	Usefulness	Usefulness	Usefulness	Usefulness
	- technology	- technology	- technology	- technology	- technology	- technology	- technology	- technology
	- features	- features	- features	- features	- features	- features	- features	- features
	- access from anywhere			- ability to re-use information	- ability to share information		- ability to re-use information	
Expected ease of use	Ease of use	Ease of use	Ease of use	Ease of use	Ease of use			
	Lack of ease of learning to use	Lack of ease of learning to use	Lack of ease of learning to use	Lack of ease of learning to use	Lack of ease of learning to use	Lack of ease of learning to use		
	Lack of ease of use	Lack of ease of use	Lack of ease of use	Lack of ease of use	Lack of ease of use	Lack of ease of use	Lack of ease of use	Lack of ease of use
	- Usability issues	- Usability issues	- Usability issues	- Usability issues	- Usability issues	- Usability issues	- Usability issues	- Usability issues
Positive/Negative								- Inability to easily re-use information
	Ability to contact super-users/peers			Ability to contact local IT- support staff/peers		Ability to contact local IT- support staff/ trainer		Ability to contact IT-support staff/ trainer
		lack of peer support	lack of peer /IT support	lack of peer /IT support	lack of peer /IT support	lack of peer /IT support	lack of peer /IT support	lack of peer /IT support
		- inability to resolve problems	- Inability to resolve problems	- Inability to resolve problems	- Inability to resolve problems	- Inability to resolve problems	- Inability to resolve problems	- Inability to resolve problems
Subjective norm	- Authoritative role		Subjective norm		Subjective norm		Subjective norm	
			Lack of subjective norm		Lack of subjective norm		Lack of subjective norm	
Ability to adapt		Ability to adapt						
			- control & ownership					
Need for professionalism & change practice								
Relative advantage								
				Lack of time				Lack of time

Table 2: Influences that encourage and discourage use over varying time periods

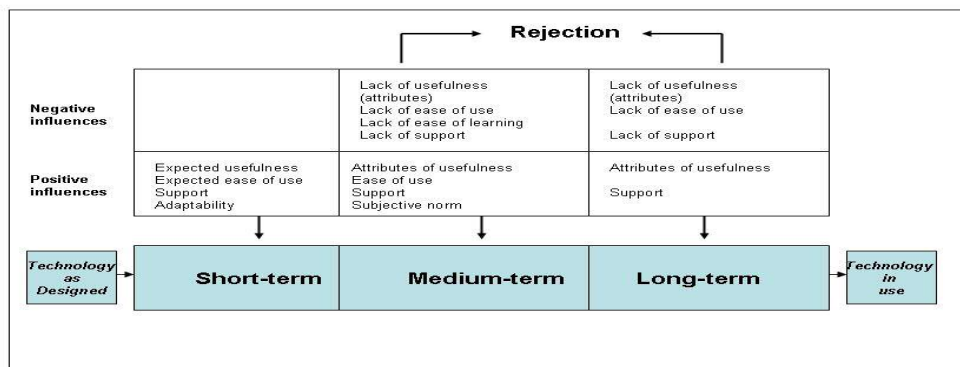


Figure 1: Process and changing influences in long-term use

However, can we conclude that the influences that encourage users decision to adopt a technology, persist beyond the initial adoption to encourage continued long-term use of a technology?

Influences that support technology use change with time as users mutually adapt the technology in different ways (Mendoza et al. 2007; Orlikowski 2000). Firstly, new attributes of influences emerge as user's needs change with time. While expected usefulness may be noted as an influence on adoption of a technology, users may need to actually experience the benefit of using a technology in the long-term. In this study we found that usefulness was indicated as a strong influence among users of the LMS through out the study (observed from weeks 1-2 until 44 weeks of actual use) supporting previous findings (Karahanna et. al. 1999). Initially usefulness was expressed in terms of the technology as a whole, the features it provides and the ability to access the technology from anywhere (noted in weeks 1-2). However, we found new attributes of usefulness emerged with time, as user needs changed. Later on, usefulness was expressed in terms of the ability to re-use information using the technology (observed in weeks 7-8, 32 and 36) and the ability to share information among others (observed in weeks 16-20). Therefore, this study reveals that as users gain experience and confidence with the technology, the need to further explore and use new features provided by the technology or use the technology in new ways, incrementally evolves over time (Mendoza et al. 2007), leading to new attributes of usefulness.

Secondly, findings from this study reveal that a lack of continued perceptions of usefulness over time may discourage further adaptation of the technology and may lead users to reject a technology in the long-term. In this study we found that some users stopped using the technology or used it in a limited way because they did not see the benefit of using it (at weeks 7-8 and 16-20) even though they had initially expected it would be useful and intended to use the LMS during their earlier encounters with it. Therefore, we argue that intentions to use a technology and perceived usefulness during the initial encounter with it may not be sufficient to encourage long-term use. Further use of a technology *enables* them to assess whether their initial expectations were *accurate* and whether they form new attributes of usefulness after experience using a technology.

This study also reveals that the ease of using a technology may be a strong influence that encourages long-term use (noted from weeks 1-2 until 16-20 weeks). More importantly, this study reveals that the lack of ease of using a technology may be a strong influence that disrupts further use and may lead users to reject the technology. The lack of ease of use may be expressed in terms of usability issues with the technology (noted from weeks 1-2 until 44 weeks of use), the lack of ease of learning to use the technology (noted from weeks 1-2 until 24 weeks) and the inability to re-use and share information (noted at 16-20 and 44 weeks). While manuals may be useful initially as a reference document, they may not always be the only way of helping users learn to use the technology (Mendoza et al. 2005, 2007; Calvert and Seddon 2006). The lack of on-line help features in the technology compounded with usability issues with the technology may discourage users from exploring and learning to use new features. In this study it was noted that some users expressed frustration with using manuals due to lack of time in searching for information or found the manuals difficult to read. In addition, we found that some users switched back and forth between their old technologies such as WEBRAFT when faced with problems related to the ease of using some of the features of the LMS, even after 24 weeks. Familiarity with prior practices may pre-empt users from learning to use new features in a technology when the technology lacks ease of use and when time is an important commodity for a user (noted in weeks 7-8 and 44 weeks).

Further, findings from this study suggest that the ability to contact trainers, IT-support staff and peers is an important influence that supports and encourages continued long-term use of a technology. We found that users contacted peers, IT-support staff or attended advanced training courses throughout the use process (noted in weeks 1-2, 7-8, at 24 and 44 weeks) to resolve problems, to learn to use new features and adapt the technology to suit new events. We also found that the lack of IT-support staff and peers to help resolve problems may lead users to limit further use (in weeks 3-4, 7-8, 16-20, at 24 and 44 weeks) or lead to rejection of the technology especially, when it lacks ease of learning to use such as the LMS (noted weeks 3-4, 7-8 and 16-20). In addition, at 44 weeks of use, users of LMS

expected trainers and managers to update them with innovative and different new ideas of using the technology. It is crucial that advanced training be provided at critical periods of technology use (see also Meta-group 2003). Therefore, we suggest that continued long-term use of a technology may be encouraged when users are able to access diverse sources of support to resolve problems, experience new benefits of using it and avoid rejection of the technology.

Findings from this study also suggest that subjective norm is an influence that encourages decision to adopt a technology and continued use of the technology (noted weeks 3-4 and later in weeks 16-20) in the medium term, especially when users perceive mandatory use of it. However, the “important others” may vary over time. We found that the university and peers in departments were the “important others” (noted in weeks 3-4). In later weeks (noted in 16-20 and 24 weeks), students and colleagues using the technology were the “important others” that influenced them. Further, findings from this study also suggest that the lack of subjective norm may discourage continued use of a technology, especially when users don’t see benefit in using it (noted in weeks 3-4, 16-20 and 24). In addition, we found that “*others use*” (Compeau et. al. 2007), especially the impact of a negative-word of mouth from peers on using specific features or the technology as a whole, may act as a disruptor for further exploration and use of a technology.

6 CONCLUSION

This paper has examined the influences that encourage and discourage continuous long-term use of an Information System called the Learning Management System in an educational setting. Two key findings emerged from this study. First, we observed that the influences that support users' decision to adopt a technology may not be sufficient to encourage continued long-term use. Influences emerge with new attributes as users continue using a technology to suit varying needs in work environments at varying times. In this study we have found that attributes of usefulness, ease of use and the ability to contact IT-support staff, peers and trainers are strong influences that support and encourage continues long-term use of a technology.

Second, rejection of a technology may take place long after adoption if users do not perceive long-term benefits of use and are unable to resolve usage issues related to learning to use and adapting a technology over time. It is therefore necessary that a variety of support mechanisms are provided to users at critical time periods to support and improve persistent and long-term use of the technology. Designers, trainers and managers need to be aware that lack of ease of use may disrupt productive outcomes from technology use and sometimes lead to rejection of a technology in the long-term. Therefore, providing training for users during the implementation stage alone may not be sufficient to support and encourage satisfactory long-term use. Localized IT and peer-support and on-going training in the form of a one-on-one contact sessions with the trainer or a local IT support staff, in addition to class-room based ongoing training courses may be a key factor in encouraging productivity and satisfaction.

These two key findings indicate that a greater emphasis must be placed on research that examines actual use of different technologies in different environments to gain a deeper understanding on the manner in which people use a technology and the influences that facilitate effective long-term use in individual work practices. In particular, further research is needed to investigate the crucial role that access to on-going support (in various forms) play in achieving productive outcomes from long-term technology use.

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