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Recommended Citation

Mendoza, Dr Antonette; Miller, Dr Tim; Pedell, Dr Sonja; and Sterling, Prof. Leon, "The role of users' emotions and associated quality goals on appropriation of systems: two case studies" (2013). *ACIS 2013 Proceedings*. 57.

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Information Systems: Transforming the Future

**24th Australasian Conference on Information
Systems, 4-6 December 2013, Melbourne**

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The role of users' emotions and associated quality goals on appropriation of systems: two case studies

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Abstract

In this paper, we examine the role of peoples' emotions or feelings about a system and the associated system qualities in encouraging adoption and effective use of systems. In two different contexts, we examine the use of a learning management system in an educational setting and a personal emergency alarm system in an aged care setting. This study reveals that technology appropriation – a term used to capture adoption and ongoing use, is driven by different emotions depending on whether users are in the adoption decision-making stage or during actual use. Findings from this study also suggest that social factors influence peoples' emotions in the decision to adopt a system. However, as people use a system over time, it is the non-functional system qualities, based on personal experiences with the look, feel, functionality and features that trigger positive and negative emotional responses. Our findings therefore propose that these emotional responses should be considered during system design and implementation to encourage appropriation and avoid rejection of systems.

Keywords

Adoption, appropriation, emotions, quality goals, rejection

INTRODUCTION

Adoption and effective use of technologies is an integral part of improving quality of work in organizational contexts, and quality of life in domestic and social contexts. While technologies have the potential to support people in their everyday work and life, this happens only when user needs are satisfied.

There is much research on adoption and acceptance of technologies (referred to as 'early period of use of IS') that has focussed on technology benefits, cost, relative advantage over other competing alternatives and the complexity of use (Davis 1989; Rogers 1995; Venkatesh, Morris, Davis & Davis 2003). There is also research on emotions in adoption of innovation and decision-making (Komiak & Benbasat 2006; Wood & Moreau 2006; Zeeleberg, Nelisse, Breugelmans & Pieters 2008; Anderson & Agarwal 2011). These studies suggest that decision making itself is often an emotional process and peoples' emotions influence adoption of innovations. However, there is limited understanding about the role of emotions on adoption and ongoing use, especially when emotions are an integral part of user experiences (Agarwal & Meyer 2009; Guinea, Ortiz & Markus 2009).

Furthermore, we lack a deeper knowledge about the kinds of emotions people experience, the functional or quality needs they look towards in a technology and how these aspects impact on adoption and use of technologies in specific contexts. One concern noted in the literature is that most studies on technology appropriation neglect specific cohorts and their special socio-technical needs (eg. the elderly in aged care context). Many existing technologies for the elderly fail because they do not address the emotional requirements of older people (Lorence & Park 2006).

Therefore, the underlying question addressed in this paper is: *What is the role of emotions and system quality goals in encouraging appropriation of systems?* We define technology appropriation as: *"the way that users evaluate and adopt, adapt and integrate a technology into their everyday practices"* (Carroll, Howard, Peck & Murphy 2003). Furthermore, in this study we refer to the term *emotion* as users' feelings about a system rather than the explicit features or properties of the system. The needs that a user expects a system to provide (e.g. "adaptability") form *quality goals* (Sterling & Taveter 2009; Miller, Pedell, Vetere, Sterling & Howard 2012).

We begin with a discussion of the theories relating to emotions, technology adoption and use, followed by the research methodology. The results are then presented and discussed in detail. The paper concludes by presenting some avenues for future work.

RESEARCH BACKGROUND

Adoption and acceptance of a technology has long been an important topic for information systems researchers (Davis 1989; Venkatesh et al. 2003). In particular, the Technology Acceptance Model (TAM) has made important contributions in predicting technology adoption and use (Davis 1989). This theory extended the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) that illustrated a person's behavioural tendency for the purpose of predicting, changing and interpreting an individual's particular behaviour (Ajzen 1995). According to TAM and its revised studies, the behavioural intention to use a system is determined by perceived usefulness, perceived ease of use, some social and gender influences on technology acceptance (Venkatesh et al. 2003). While a perception is necessary to start an emotional process, it is this perception that can directly produce an emotional feeling (Plutchik 2002). Although a significant body of work has focussed on TAM in predicting use based on perceptions, there is little research into the role of emotions among different cohorts and how technologies trigger positive and negative emotions during appropriation.

Emotions are present both before and after decisions are made (Zeeleberg et al. 2008; Beaudry & Pinsonneault 2010). According to studies on consumer evaluation and early use of innovations, emotions are mechanisms that communicate important information relative to expected progress towards goal achievement (Lucas, Payne & Bettman 2001). These studies suggest that during the decision to adopt a system, consumers experience positive emotions when "expected progress towards an activated goal is accelerated or attained" (eg., learning to use) and; negative emotions occur when "expected progress towards an activated goal is impeded". One study on affective responses during learning to use a new product suggests that users often experience misplaced expectations about product complexity and usability before use. These misplaced expectations trigger negative emotions that have a powerful influence on product evaluation and satisfaction (Wood & Moreau 2006). Another study suggests that emotional trust and familiarity plays an important role in determining customers' intention to adopt (Komiak & Benbasat 2006). However, these studies focus on evaluation and early use assuming that emotions experienced during early use continue to influence longer-term use, despite the realization that technology appropriation is dynamic in nature (Carroll et al. 2003).

One concern noted in the literature is that most studies on technology appropriation neglect specific cohorts and their special socio-technical needs. A special case would be technology appropriation by the elderly. Technology for older adults is likely to fail unless it can be used effortlessly and it serves a clear and meaningful purpose (Lindley, Harper & Sellen 2009). The use of assistive technologies is increasing to help older people remain living in their own homes (Tinker 2003). According to some prior studies on system use by the elderly, it is suggested that their willingness to use an assistive system depends on several complex factors that include: the needs that people perceive (Roelands, Van Oost, Buysse & Depoorter 2002); the perceived usefulness of the system (Chamberlain, Evans, Neighbour & Hughes 2001); and whether the individual feels that use of the device either supports or undermines their sense of personal identity (Gitlin, Luborsky & Schemm 1998; Anderson & Agarwal 2011). One study on the acceptability of assistive technologies suggests that older users accept a system when they experience a combined effect of 'felt need' and 'product quality' (McCreadie & Tinker 2005). Personal alarm systems are one example of an assistive technology that is designed for older people and people with disabilities to support independent living by enabling them to gain assistance in an emergency (Fisk 2003). In recent years there has been a growing interest in the design of technologies for older people and the need for positive design (Birmholtz & Jones-Rounds 2010). Some studies have also argued that it is important for designers to take into account particular communication preferences, needs and strengths of older users when developing technologies for the elderly (Lindley, Harper & Sellen 2009). While focus has been placed on design of such technologies, one aspect that has been neglected is the feelings of older people, their interests and how these systems fit into their lives. Therefore, this study aims to address this by: (1) capturing peoples' emotions during the decision to adopt and during actual use a system and (2) identifying how some quality goals of a system trigger positive and negative emotions among users.

RESEARCH METHODOLOGY

A case study approach was used in this study because the aim of this study was to gain deeper knowledge about 'how' and 'why' emotions and quality goals of systems influenced individuals as they adopt and use socio-technical system within a real-life context. In order to provide a diverse and deeper understanding of the role of emotions and quality goals on use of different systems by different cohorts, this study selected two diverse cases namely: (1) users of a Learning Management System (LMS) and; (2) elderly users of Personal Emergency Alarm Systems (PEAS). While some findings related to the influences that encouraged and discouraged LMS users have already been published earlier (Mendoza, Stern & Carroll 2008), in this paper we focus specifically on the emotions and quality goals experienced by the LMS users. The results from both cases are used for comparative analysis.

The LMS case study was undertaken between January 2006 and March 2008 at the University of Melbourne. We chose users of the LMS because the university had introduced this new system to support teaching and learning among staff and students. At this time, all subjects would become available to the LMS and all staff would be faced with the decision about whether to adopt and use the technology. Twenty-three participants (7 female and 16 male) agreed to take part in the study. The participants were academics in the institution. None of them had prior experience with the LMS, but 15 out of the 23 participants had previously used technology-based learning systems such as WEBRAFT (9) or had developed their own web pages as a communication tool in their teaching.

The PEAS case study aimed to generate a better understanding of the emotions, challenges, benefits, and opportunities that are encountered when elderly people use emergency alarms in the domestic space. Emergency systems typically have two features: (1) an *emergency alarm*: the user can raise an alarm if they require emergency attention; e.g. via pushing a button on a pendant worn around the user's neck; and (2) a *wellbeing check*: the user informs the service provider that they are fine, on a daily basis; e.g. via a button on a base station connected to a telephone line. If no indication of wellbeing is received during a specified period, the service provider initiates checks on the user.

The PEAS case study was undertaken between January 2013 and May 2013. In the PEAS case study, 8 (4 users, 4 relatives) semi-structured interviews were conducted with users of emergency alarms and their relatives. The users of the emergency alarms were aged between 85 to 91 years. The users of the alarm systems had it installed in their homes. Many local council services in Australia pay for the service and offer it for the people who need it most. PEAS are usually introduced when an older person lives alone and/or at critical periods when they have a traumatic event such as after a fall.

The interviews took place at a location of convenience for the interviewees, most commonly in their homes. This gave the researchers a good insight into the living conditions and the setup of the emergency alarms. The focus of the interviews was on emotions, benefits, and challenges around using the emergency technology and technology in general. The issues explored during the interviews were related to technologies they were already using, how they made the decision to sign up for the PEAS, their feelings about using the system, attitudes, perceptions and actual experiences with the technology. Table 1 summarizes the data collection techniques, number of participants and issues explored in the case studies.

Case study	Techniques	Number of participants	Issues explored
LMS	Interviews, observations	23	<ul style="list-style-type: none"> • Post hoc recollection of reasons for the decision to adopt technology • Their feelings including likes/dislikes, attitude and expectations during their encounter with the system
PEAS		8 (4 users, 4 relatives)	<ul style="list-style-type: none"> • Challenges and benefits experienced by of the system including the 'look and feel' of the system during use • Role of the technology in users' life style • Expectations of support required and received

Table 1: Summary: data collection techniques, number of participants and issues explored in the two case studies

Interviews were also conducted with four relatives in order to receive complementary data and a second perspective on the impact of the PEAS on the life of the older relatives. It is important to note that in many instances, due to the age of the users of the PEAS and some had passed away, the relatives provided insights into how the elderly users of the system felt or perceived the system. All interviews were audio-recorded with the consent of the participants. In addition, the researchers made field notes at interviews and observations. All data were coded and key themes were identified through content analysis. Researchers discussed and reached agreements about the important themes of the interview. Diagrams and models were used to display, analyse and refine the themes from the data.

In this paper, it is important to note that the research findings are presented and their implications are discussed with a specific focus on the emotions and quality goals of users of the LMS and PEAS. The results from both case studies are organized and presented as one.

RESULTS

All participants in the LMS and PEAS case study were provided with some basic training. The LMS users were provided with a manual and classroom based training before adopting the system. As for the PEAS participants, a technician was sent to homes to install the system. The potential PEAS users were given a quick walk-through of the system along with a manual. Also, it is important to note that the LMS had a lot of features that users could use in their teaching activities. Whereas, users of the PEAS had only the pendent for emergency situations and a green button on the base station that needed to be activated once a day.

Decision to adopt

Noted in this study, are some emotions experienced by participants during this decision-making process. These emotions were mostly cohort and context specific in nature. Apart from the fact that participants in both case studies perceived benefits in using the systems, some emotions were common to both cases: feeling of obligation and compulsion. Further, some emotions pertained to specific cases. While the users of LMS displayed a sense of anticipation, the PEAS users displayed a feeling of assurance, relief and freedom.

Feeling of obligation (PEAS and LMS): It was clear that the decision to install the PEAS was made by family members or relatives, and the elderly users of the PEAS had no choice but to accept the concerns of family members. For example, one of the participants (a relative) was aware that the elderly user accepted the PEAS because, "*she didn't want to upset me and she didn't want me to feel like she wasn't cooperating with me*".

In the LMS case study, while participants made their own choice whether or not to adopt the LMS, they still felt a sense of obligation towards people important to them: "*students have an expectation that there will be online contact*" or "*We were strongly encouraged in the department to put our hands up*". Further, it was noted that the authoritative role held by some of the participants influenced their decision to adopt the LMS. For example one of the participants commented, "*I did [adopt], not so much because I desperately wanted to use the system...being the Associate Dean, I felt the sort of responsibility of understanding the system*".

Feeling of compulsion (PEAS and LMS): The need to take control of one's choices was an important theme noted in the PEAS study. One of the participants was quite forceful about the importance to be in control about her own life and the choices she wanted to make, "*With the emergency alarm take up there are in my opinion other issues...but we are all dying one day. People have to have the right to make a decision when they want to leave...One reason I wouldn't want to be monitored is that if something happens I want to be left alone*". Similarly, some of the LMS participants thought that they had no choice but to adopt and use the LMS because their prior choice of technology may not be supported in the future, "*WEBRAFT will be phased out at some point and the LMS will be the one we use*". It was noted that most participants felt that it was a requirement by the university that they adopt the technology, "*whatever decision the university makes, you have to use it*".

A feeling of assurance (PEAS): In the PEAS study, it was noted that relatives of users felt a sense assurance and relief having the PEAS installed in the homes of their family members. The burden of checking and worrying seemed to be lessened and they felt they could assume that the older person was safe as long as they did not hear from the service provider. For example one of the relatives said, "*Because she was living by herself, if she had a fall or something happened to her, there was somebody calling in every day, we would at least know that she was OK*". Another participant (a daughter) commented, "*The fact that you'd call and you think, "Well, she hasn't answered. Is she at home or has she fallen?" I just knew there were somebody else helping with that caring*".

A sense of freedom (PEAS): Relatives of the elderly users also felt a sense of freedom when the PEAS were set up. One of relatives felt that once the PEAS was installed in her mothers' home, she could focus on more relevant and fun things to do with her mother, "*Like where we can actually offload some of that work that's a bit more mundane and a bit more not so personal, get other people in to do it. So having the monitoring, we're not having to do that extra little piece of work*" or "*...a huge weight is off my shoulders*".

A sense of anticipation (LMS): Anticipation was associated with four qualities that users expected the system to possess, namely: usefulness, ease of use, relative advantage and integration with other self-developed applications. All participants felt that the LMS would be useful in their teaching practice, "*For communication for students and staff and I'm thinking that it is going to be very useful*". Participants were also optimistic about the ease of use, "*I'm hoping that it's simple and easy to use for me and students*". Furthermore, 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*". Also, participants anticipated that they would be able to integrate the LMS with self-developed applications, "*I'm using film clips on the web and online exercises for listening comprehension to put pressure on myself to use the LMS*".

Actual use

Described in this section, are the emotions expressed by participants in both case studies in association with the quality goals of the system such as: usefulness; adaptability; ease of use and learning to use and; support facilities.

Usefulness

Usefulness was a quality goal of the system that was expressed by both the PEAS and LMS users. Predominantly, the emotions associated with usefulness were specific to the system. All users and relatives of

the PEAS perceived usefulness of the PEAS in their homes. Usefulness was expressed in terms of both positive and negative emotions such as: feeling independent, resentment, secure, confidence and feeling in-touch.

Feeling of (lack of) independence (PEAS): Usefulness of the PEAS was associated with the feeling of independence, but both positive and negatively. While some participants felt they gained independence after the installation of the PEAS, others felt they lost control and independence. For example, one participant (relative) felt more independent because of the pendant, *"She liked it because it gave her a little bit of independence, and we loved it because we felt, well, we know she's safe. And if she has fallen...she is not going to be laying on the floor for hours and hours or a day until somebody comes to the house"* or *"I think she felt that she'd got her independence back"*. There were some suggestions about feeling less independent. One participant said that his mother felt negative about using the PEAS as she was required to wear pendant around her neck, *"It threatened her independence...she felt that it branded in a way that made her less independent"* and added *"Look at what my kids are making me do, look what I'm resorted to...she had a slight resentfulness about it"*.

Feeling secure and confident (PEAS and LMS): All participants felt safe using the PEAS. This feeling of security was particularly strong with one of the participants who expressed several times during the interview as did her daughter that, *"It gives me confidence and security"* and *"...basically because I've got this MEPAC (PEAS), I've got confidence when I'm on my own"*. LMS users were confident about the usefulness of the system *"this is useful... it gives a professional way of providing information to students"*.

Feeling in-touch (PEAS): One of the participants (a relative) stated that her mother felt less- isolated with the use of the PEAS, *"She wants to stay in her own home, she was quite happy to be there...it did give her a bit of comfort, knowing that she wasn't totally isolated, and if something happened, she wore it (pendent)"*

Feeling of stress (PEAS): It seemed that the underlying problem seemed to be that the activity of pressing the button. For a few users, *"The biggest problem is it didn't get integrated into my mother's life and part of the routines that she had...she never really viewed it positively...it was kind of a necessity...and it only ever remained something you put up with...it was a source of stress and we turned it off"*.

Adaptability

While participants in both cases stated that adaptability was a important aspect, this quality goal 'adaptability' included integration, mobility and visibility. And, the emotions associated with adaptability were: a feeling of control and ownership, anxiety and stress, obligation, blame, uncertainty and embarrassment.

Feeling of control and ownership (LMS): The ability to easily adapt the system by customizing the look and feel of the LMS and have the flexibility to change the setup whenever needs arise continued to influence participants. For example one of the participants commented, *"I like the fact that I control it...so I feel quite comfortable pressing buttons"*. Another participant said, *"I think it gives you control, it means that, when we were getting our lectures loaded it was always going to another person, you then depended on them being in the office... so for me the LMS is really saying – this is my subject, yes it is more ownership"*.

Integration - Feeling of anxiety and stress (PEAS): The lack of integration into everyday routine was expressed as a negative quality with the PEAS. This triggered a feeling of stress among users of the PEAS. It was a requirement for users of the PEAS to push a wellbeing check button on the base device everyday between 7am – 11am. If the button was not pressed between those times, the service provider calls the user to find out if there was a problem. This rigid timeline was a problem for some users, as they would forget to press the button. This triggered stress and anxiety. One of the participants (a relative) said that his mother found it difficult to make this task a part of her regular routine, *"I went over there and she wasn't so confident about the time, and was stressed about what she was doing or not. It never became a routine"*. Another participant said, *"And quite honestly, at the end, we actually turned off the service at the end of the month, because we were not happy with it. It was stressing my mother, it was stressing me"*.

Integration - Feeling of blame and obligation (PEAS): A feeling of blame was also expressed when some participants forgot to press the wellbeing check button at the specified time. For example one of the participants said, *"Out of 10 times at least three times I forget. It doesn't matter how – what situation I try to take on – I forget. Then the poor girl – she has to phone me after 12. But I have tried to put myself into a system. So get out of bed point 1, go to the toilet point 2, then I have a signal here I have to push – this one here I press"*. It was also noted that one participant stopped using the PEAS. According the relative, his mother did not raise an alarm and in one instance she fell and could not get up herself. The reason was, *"I didn't want to bother you. I was OK. I figured you would come and get me at some stage"*.

Mobility - Feeling of uncertainty (PEAS): One of the most common concerns among participants was about the range of the device. They had an approximate idea of the mobility reach, but were not sure what this meant in their home environment. This concern is reflected in one of the comments, *"...but I wanted to try and work out"*

exactly what this range was and I couldn't get a straight answer really from the company...you know these are old houses with solid double brick wall...I ended up doing some tests. Because I started becoming anxious about 'well what happens if she's in', you know the back corner". Another participant said, *"if you were, in our house, in our garden, its an acre, and if I was down the end of the garden and fell and hurt myself, I'm not too sure if they'd get the recording of my button...therefore you need to carry a mobile phone with you".*

Visibility - Feeling of embarrassment (PEAS): The visibility of the emergency pendant worn around the neck caused problems as in some cases it would result in the pendant not to be worn. One of the participants mentioned that his aunt did not want the pendant to be visible to others. The relative commented, *"She would say, 'oh it's in my handbag' or 'I don't carry it on Tuesdays because I'm meeting up with some friends'...I didn't find anyone in her peer group that had anything positive to say about them"* or *"She always would joke about her cowbell and complain about it"*.

Ease of use and ease of learning to use

As participants began to learn to use the LMS and PEAS in their everyday routine, they expressed a variety of emotions. These emotions were associated with the qualities of the systems; namely ease of using and learning to use the system. Feeling of comfort was an emotion that continued to be expressed in both a positive and a negative way. Other prominent emotions associated with ease of use and learning to use were: intuition, comfort, confusion, uncertainty, repression anticipation, disconnect and incompetence.

Intuition and feeling of comfort (LMS): Ease of using the LMS positively influenced some of the participants. Participants commented that the LMS was user-friendly and intuitive to use, *"I can say I think it's been quite easy and intuitive so far"*. However, opinions were divided among participants about the ease of use. For example one of the participants said, *"I found that navigating not intuitive...too many OK buttons to click on"*.

Feeling of confusion (LMS): Difficulty in learning to use the LMS was noted among participants. They expressed frustration with the terminology and the number of steps they had to remember while learning to use the technology, *"It is going to take me quite some time to get a map of it into my head and to understand what all the options are for me... the fact that there's confusing labels and many steps is kind of difficult"*.

Feeling of uncertainty (LMS): Difficulty in easily using the LMS in terms of usability issues with the design of the LMS continued to frustrate participants. They sometimes got lost in the process of switching between windows, *"After you click submit and OK...or maybe it takes me back to the OK page...so there's an uncertainty about whether, I've achieved my mission and I'm not sure of where I am there, and that's not helping"*.

Feeling of repression and anticipation (LMS): The lack of ease of learning to use features provided by the LMS acted as a hurdle for further use, *"I'm slightly more intimidated by the idea of things I wanted to do with it [LMS]... just because I see how it's not intuitive, I'm just wondering...I'm just repressing it for now and I'll deal with it in the break and I hope people will be around to help"*.

A sense of disconnect (PEAS): A resistance to use the PEAS was related to a lack of understanding and information provided to them. Use varied greatly in how well they understood the system or the information given. One of the participants commented that he did not really know how the PEAS worked and rarely used it, *"I don't know what the display is for... I don't look at it"*. This participant then referred to his caretakers, stating that they were using the system for him. When asked what the coloured buttons do, he was not sure of their function, *"The green button? The green button is for silly questions – actually I have no idea"*.

Incompetence (PEAS): The resistance of some of the older adults to use the PEAS was closely connected to a feeling of being incompetent – a feeling whether or not they were able to use it as instructed. They felt annoyed about themselves when they forgot to press the button. For example, one participant said, *"And no matter what system I try [claps with hand on his knee in frustration and enforcement several times] I still manage out of 10 days that I miss out 2 or 3 times by completely forgetting and that is what annoys me"*.

Support

In the LMS case study, emotions expressed by participants in relation to the quality goal 'support' were mostly associated with a variety of training and support facilities that they either received or expected to receive while using the LMS. An in-depth understanding of the role of support in the LMS case study has been previously published (Mendoza et al. 2010). In this section, focus will be placed on the emotions expressed by participants in relation to the support facilities they received within and outside the system. The emotions were: feeling supported, isolation, assurance, trust and anticipation.

Feeling supported (LMS): During the use of the LMS, participants resolved problems that they encountered by contacting lead-users and peers in the department: *"There's an informal group of people in our department who are using LMS and we met...and people who already knew about it were telling new people like me things that*

we needed to know". Some participants called for assistance from IT support staff in their departments or even contacted the trainer from the initial course when they ran into problems, *"I've had to get help...from [trainers] of LMS and the IT person in our department to work out that the problem, yes, I needed assistance"*. A lack of support frustrated some users. For example, one of the participants found the user manual unhelpful and too detailed, *"I think sometimes too much detail is worse than not having enough...I got overwhelmed by the manual"*.

Feeling of isolation (LMS and PEAS): It was observed the lack of localized IT or peer support appeared to be a negative influence for some participants. For example, *"We don't have any support-technical assistant to help us...if there were a group of us in the department using it and say come on let's do it together... that might be better... I'm isolated and with a reasonable teaching workload it's not happening"*. In the PEAS study, it was noted that the elderly participants (user) felt a need to have contact with people. The PEAS was perceived as a contact point to the outside world in some cases when people were living alone. One participant (user) said, *"Very comforting that you've got that contact, otherwise you're on your own. You know, you've got no one"*.

Feeling of anticipation (LMS): Some participants continued to think about possible further use of the LMS in their teaching practices. For example one participant wanted to use the discussion forum on the LMS to encourage communication among students, *"I'm hoping to use the LMS discussion forum...I have not used any of these things at the moment"* and *"I have been looking out for seminars, just to learn to use those features... and how others use the LMS"*.

Feeling of assurance (PEAS): Participants (users of the PEAS) had to press the wellbeing check every day and in return did not receive any human communication. This lack of human support triggered a lack of assurance among users, *"If it were a real voice, it would be even more re-assuring than a recorded voice"*.

Feeling of trust (PEAS): It was also interesting to note that participants expressed a feeling of trust when some trusted body or person installed the PEAS. This feeling of trust encouraged adoption of the PEAS, *"Well if you've set this up I trust that what you've got me is the best thing that's there"*.

Summary of findings

Figure 1 shows a variety of emotions during the decision to adopt the system and during actual use. An attempt is made to illustrate how quality goals (usefulness, adaptability, ease of use/learning to use and support) trigger different positive and negative emotions among users during actual use. In Figure 1, emotions are represented as hearts and quality goals as clouds (Sterling & Taveter 2009).

DISCUSSION

In this paper, the research question, *"What is the role of emotions and quality goals in encouraging appropriation of systems?"* is addressed. Based on the findings from the study, Figure 1 illustrates the emotions and associated quality goals that influence users of *both* the learning management system in an educational setting and an emergency alarm system used by the elderly in their homes.

Findings from this study suggest that appropriation of a system is driven by different emotions depending on whether users are in the adoption decision-making stage or actual use as a part of their everyday routine. In this study, emotions that influenced the decision to adopt were predominantly context-based that include feelings of obligation, compulsion, assurance and freedom. It was noted that anticipation is the one emotion experienced by users that relate to their expectations of the system (noted in LMS study) during adoption.

This study suggests that both *obligation* and *compulsion* can be important emotions that influence the adoption decision process. People chose to adopt a system because people important to them expect them to, similar to subjective norm (Davis 1989). Furthermore, findings from this study suggest that users can feel a sense of *obligation* when: (1) they hold authoritative roles and; (2) they wish to make people important to them feel a positive emotion (for example, assurance). On the one hand, the feeling of obligation can be viewed as a positive emotion, especially when users want to make others feel positive. However, on the other hand, this emotion could trigger a negative emotion, a feeling of *compulsion* to adopt. In the study at hand, users felt a need to have the ability to make personal choices on whether or not to adopt a system based on when and why they need it. For example, in the LMS and PEAS cases, it was shown that users expressed frustration about the way their choices were taken away due to decisions made by others.

This study also reveals that a system that is imposed on a user is not accepted with a positive emotion unless there are other dominant positive emotions that empower the decision making process. Findings from this study reveal that emotions such as *assurance*, sense of *freedom* and *anticipation* were prominent positive emotions that influenced the adopt decision process.

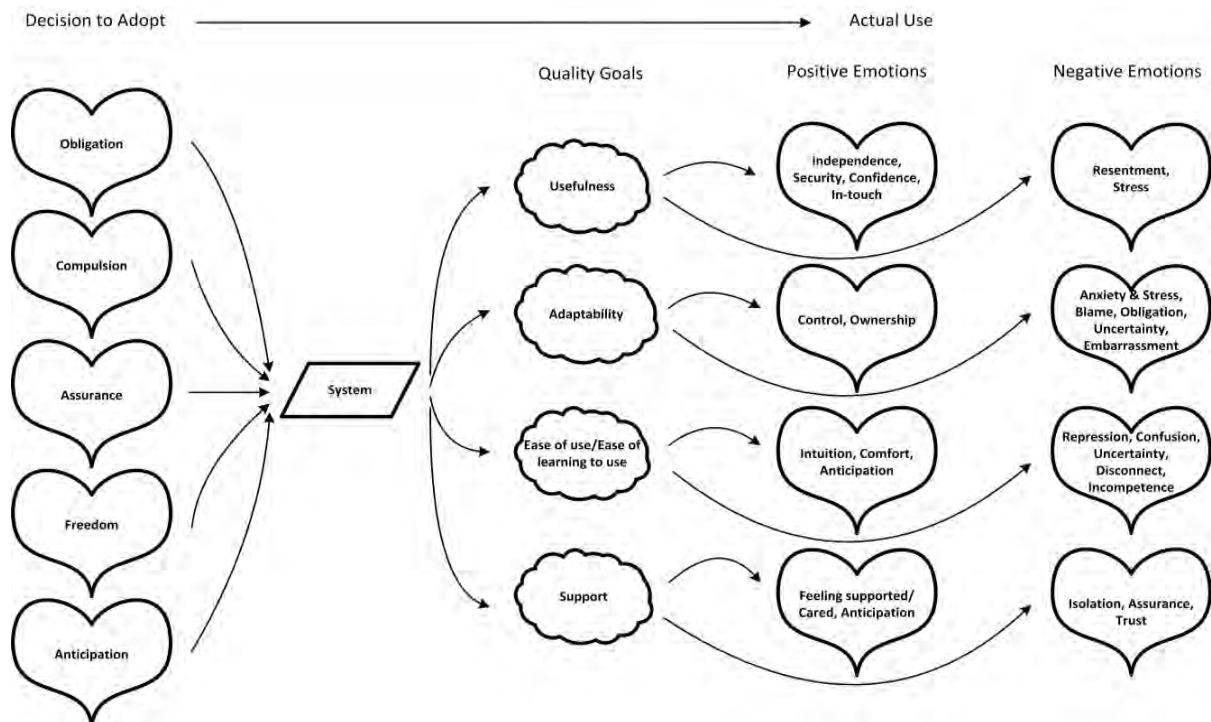


Figure 1: quality goals and emotions during decision to adopt and actual use

Users feel assured when they perceive that the system performs as expected, especially in providing support and care for people important to them (observed in PEAS case study). Also, findings in this study suggest that people decide to adopt a system when they perceive that the system can provide them with a feeling of freedom. This emotion *freedom* could relate to the belief that the system would take-over some of their responsibilities, save time and alleviate their burdens (noted in PEAS case). Additionally, findings from this study suggest that *anticipation* can be a positive trigger for adoption. This emotion is associated closely to users' feelings about the system's quality goals – the look, feel and functionality. Users experience a feeling of anticipation that the system would be: useful, ease to use, better than their prior practices and easy to integrate into their everyday practices supporting prior studies (Davis 1989; Rogers 1995; Carroll et al. 2003).

This study reveals that, during actual user, users experience a variety of emotions, mostly ones triggered by the quality goals of the system. Findings from this study suggest that usefulness, adaptability, ease of use, ease of learning to use and support are prominent quality goals that drive user' emotions during actual use, triggering both positive and negative emotions among users of the system (see Figure 1).

In the study at hand, users experienced a feeling of independence, security, confidence, being in-touch, resentment and stress in relation to the benefits provided by the system. When users do not see benefits from using a system, they question their decisions and tend to resent or stress about using it. This resentment and stress can cause limited use or even rejection of the system (observed in both cases where participants stopped using the LMS or PEAS). It is important that managers, trainers, service providers and IT professionals help people realise the benefits of a system. And this is possible only when they realise why users feel stress and/or resentment towards using the system and find strategies to mitigate these negative emotions.

Furthermore, this study reveals that the ability to adapt a system to suit ones needs is an important quality goal for a system to possess. And this quality goal triggers both positive and negative emotions depending on how easily users are able to customize, integrate, mobilise and visualise functions in a system. Findings from this study show that users experience a sense of *control* and *ownership* when they easily adapt the system to suit their life style or work practices. However, a lack of adaptability triggers *anxiety*, *stress* and *uncertainty* among them (observed in both cases). Due to these negative emotions, users blame themselves for their *incompetence* and/or continue to feel obliged to using the system.

Also, findings from this study confirm that if systems are easy to use and are designed to be intuitive and easy to learn to use, then users feel comfortable in using the system. The positive emotion of *comfort* creates a sense of anticipation to further use the system. However, when systems are not user-friendly and easy to learn to use, users experience negative emotions. Difficulty in using the system creates *confusion* and *uncertainty* among users. And, users build resistance and *disconnect* with the system. This disconnect could limit the use of the system or even lead to rejection of the system (noted in LMS and PEAS study). For example, it was noted in the

PEAS study that one user rarely used the system because he was unsure of what the function of the EAS base station and mentioned that his caretaker used the system on his behalf. Additionally, in this study it was noted that negative emotions were strong during adaptation and learning to use the system. It is therefore important that systems are designed for simple, intuitive and easy use.

In addition, an important quality that systems must possess relates to *support*. Further, this study reveals that support, a quality goal triggers both social and system related emotions. In this study, it was noted that users called for help when they needed to resolve problems. Depending upon the kind and level of support, they felt *cared for* and supported. To this effect, they even felt a sense of *anticipation* to further appropriate the system (noted in LMS study). A key essential among users of the LMS when faced with problems while using the system was the ability to have access to support staff, receive support from peers and complain about not having a HELP feature on the LMS. Two prominent emotions related to the quality goal support are *trust* and *isolation*. Users feel they could trust the system because important people lend support during the installation and use of the systems. Additionally, the ability to contact support staff and talk to a human voice when faced with problems could make users feel less isolated (observed in PEAS and LMS cases). And, the lack of such support creates a feeling of isolation and could lead to rejection of the system (noted in the LMS study).

Finally, this study suggests that limited use or even rejection of a system happens when users experience negative emotions such as stress and anxiety, stigma associated with the use of the system, isolation, incompetence and uncertainty. These emotions are associated with experiences related to certain quality goals in the system: adaptability, ease of use and support. It is therefore important to realise that it is important that IT professionals and trainers have access to this knowledge of how users feel and what quality goals of systems trigger positive and negative emotions. It is essential that users experience higher levels of positive emotions with lower or no negative emotions for satisfactory and effective use. This study therefore proposes that, with this knowledge about emotions and associated quality goals of the system, designers, trainers, change management teams and service providers, could design strategies that target mitigation of negative emotions; resolve conflicts and; influence users to feel positive about the system.

CONCLUSION

Based on two cases, this study has detailed the role of emotions and associated quality goals that influence the adoption and effective use of two different socio-technical systems – a learning management system and a personal emergency alarm system. This knowledge is crucial for two reasons. One, it provides insight into peoples' emotions and could help trainers, IT professionals and change management teams to support users in adoption and effective use of new systems that are rolled out into society or an organization. Two, the capture of emotions and quality goals in the form of an emotionally driven goal model could help positive design of systems, thereby, bridging the gap between peoples' emotions, personal values and qualities of the system into tangible aspects of design. As a result, systems can be designed to achieve users' personal values, and motivate them to continue using the system as it encourages positive emotions; at the same time helps mitigate negative emotions and avoid rejection. One limitation in the PEAS case study was in the number of participants interviewed. At present, as a part of a larger study, we are addressing this limitation. Our future research will focus on exploring and gaining deeper understanding about: (1) changing emotions user over time; (2) relationships between user emotions and quality goals expected of a system in complex socio-technical contexts; (3) improving requirements gathering methodologies to capture emotions and related quality goals of users in software engineering; and (4) innovative ways to develop emotionally-driven goal models and effectively map these goal models to the design and development of systems for acceptance and effective longer-term use.

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