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Adoption of Instant Messaging Technologies by University Students

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Abstract

The main objective of this paper is to better understand the nature and patterns of students' socialization patterns in relation to the adoption of Instant Messaging (IM) systems. A model based on the Extended Planned Behavior Theory (EPBT) was applied to a sample of 80 students of software engineering at the University of New South Wales, Australia. Based on the EPBT model, a questionnaire was administered to these students. A number of key concepts were identified in relation to the students' adoption of IM. It was also found that students use IM to support a number of task-related purposes such as collaborating with their classmates about group work and assignments, as well as for scheduling and coordinating meetings and significant results were obtained.

Keywords

Instant Messaging, Socialization, Technology Adoption, Extended Planned Behavior Theory (EPBT)

Introduction

We now live in an increasingly dispersed environment. Many people telecommute or pursue distance education. Many offices are virtual without even an actual structure to call their own. Companies have employees scattered throughout the world. Our travel infrastructure has yet to properly react to this dispersion, so we must find new ways to keep people in touch. The Instant Messaging is one method that people adopt to do this (Pascal 2003) The IM happens to be one of the most widely used communication services for this purpose. It enables users to create a private chat room with another individual in order to communicate in real time over the Internet, similar to a telephone conversation but using text-based communication. A typical IM system alerts a member whenever someone else on the member's private list comes online. A chat session can then be initiated between them (Webopedia 2007).

The origin of the IM systems goes back to the earlier generations of 'chats', which is a real-time interpersonal communication and social interaction. Today, IM systems are used in enterprises and across almost every electronic device conceivable (Sheele 2007). Based on the second annual Instant Messaging Trends Survey by AOL (2004), IM continues to be a surging medium with more than 7 billion instant messages being sent every day worldwide. The report suggests that there are 250 Million people across the globe, and nearly 80 million in Americans, who regularly use IM as a quick and convenient communications medium. The study also estimated that 59 percent of Internet users use IM, 43 percent of employed IM users use it at work, 29 percent of IM users say they send more IM's than the emails per day, with 20 percent sending mobile IM's or SMS text messages through a personal mobile device. The report also shows that IM has now been adopted among all age groups, with 90 percent of online 13-21 year olds, 71 percent of online 22-34 year olds, 55 percent of online 35-54 year olds and 48 percent of online over 55 year olds, using IM (Fonder 2004). The most recent data on IM usage indicate that AOL alone carries two million messages every day and the IM software stays open on the desktop

for an average of six hours a day (BBC 2007). New offerings include integrated radio station feeds, characters that represent you whilst on line, customisable backgrounds, and 13 new emoticons (Ibid).

Among teenagers and younger aged users online, IM has become a social phenomenon. It is now becoming a mainstream form of interpersonal communication. It is also suggested that it is used in order for them to conform and increase socializing opportunities with their peers. It is a less expensive means to stay in touch with their friends (Greiner & Palen 2002). The rise in popularity of IM in recent years has gradually led to its acceptance as valuable method of communication in both academic and corporate environments Greene & Mahony 2004). For example, despite the concerns from management, workers are becoming more productive as a result of using IM in their workplaces. They use IM to communicate with their co-workers to find someone in less time than using a phone (Stone & Merrion 2004).

As it emerges from the world of teenage chat, IM—sending text messages and, ultimately, audio, video, indeed, files of any sort, interactively—is already being put to use at corporations like IBM Corp. and Accenture Ltd. (Cherry 2000). Workers in these organizations are using IM to share documents remotely, to ask a quick question of one another, or to exchange notes during a meeting. Disney has inserted real-time messaging in dozens of networked games, and Yahoo, added chat functions to its web casts of live music performances so that the concert goers can interact as they do at a real concert. IM is even being used at auto racetracks so that pit-crew members can communicate with each other (Ibid).

With the widespread adoption of this technology, much effort has been put forward to understand the various reasons for adoption and the various patterns of use of this dynamic technology, especially among teenagers as social users and workers in organizations. However, less attention has been spent on understanding the adoption habits of tertiary students in their post teenage years and pre-working life. Understanding this particular user group in the context of Instant Messaging is the main contribution of this paper. Results of this study will also be valuable to organizations, as students of today will constitute the workforce of the near future. Understanding students' usage of IM also provides greater insight for educators and course facilitators into harnessing the power of this technology. This paper is an empirical study that explores various uses of IM by university students by understanding reasons for adoption. An existing technology adoption models is used as the theoretical foundation of this study.

Literature Review

An Overview

Many studies have been conducted in the area of IM ranging from social and domestication studies to workplace research. These studies mainly focus on three main areas: i) the character or properties of IM conversations, ii) the functions of IM (i.e. the tasks it is used to support), and iii) the pattern of IM use (i.e. how frequently people use IM and with whom). There are also a small number of studies that have focused on understanding the various reasons of adoption of IM technologies. The summaries of relevant studies are presented in the next section.

Research Approaches in IM

One study (Muller et al., 2007), claims to be the first study of instant messaging (IM) based on large samples of users' self reports. It describes the introduction of Lotus Same-time, an IM product, into three business organizations. Across the three organizations, it found substantially similar patterns in savings (i.e. reduced use of other communications channels), attitudes, and social networks.

In another study researchers recognized the concept of "outeraction", in which IM is used to set up more substantive interactions in richer media. Using a self-reporting approach, it identified a large number of potential motivations for using IM, including negotiating availability, maintaining personal/social connections, getting a quick answer to a question; testing a software fix, coordinating and scheduling, maintaining a persistent context of interaction history, better control over workplace interruptions, and user-controlled inter penetration of family life and work life (Nardi, Whittaker & Bradner 2000).

Two significant studies in the field of Instant Messaging (Isaac et al., 2007; Herbsleb et al. 2007) dealt with the server log analysis approach. In one of the studies (Isaac et al., 2007), thousands of workplace IM conversations were logged and later evaluated to gain an understanding of workplace IM usage. This study collected a large sample of direct observations, over 21000 IM conversations by 437 users, arguably providing a more accurate picture of IM usage characteristics. The research revealed a number of facts about the usage patterns of IM and also the purpose and style of use. It found that the primary use of workplace IM was for complex work discussions (Ibid).

A study by Campbell, Stanziole & Jinijuan (2003) takes a lower level approach to understanding IM by examining keystroke level data to understand what is happening between the sending of messages. The findings showed that only 43% of the actual time was spend typing messages. An average of 12% of that composition time was spent revising and text that had already been written, often making substantial changes. The results showed great room for improvement in interface design of IM clients, in order to improve the efficiency of message composition (Ibid).

Another study by de Vos, ter Hofte & de Poot (2004) investigated the adoption of IM from four months before to three months after it was formally introduced into a mid sized organization. The case study consists of 104 persons using a mix of surveys, interviews and the examination of traffic logs. The study attempted to investigate the adoption patterns of users in the workplace based on the decomposed Theory of Planned Behavior (TPB). It was found that the more useful people perceive IM to be, the more they use it. It was also found that people with a lower level of self-efficacy, or ability to learn new technologies tended to use IM less and used more by workers who felt it was compatible with their work. The influence of social contacts to use IM had a stronger influence than that of project members in the workplace. It was also found that remarkably, business mobile phone users tended to use IM less than others. However the study was not able to conclude as to whether IM and mobile phone use are substitutes. However they were able to conclude that IM use was not a substitute for email use.

Technology Adoption

This section attempts to highlight the theoretical bases for this study. Two major models, that is, the Technology Acceptance Model (TAM) (Davis 1989), and the Theory of Planned Behavior (Ajzen 2002) are described followed by the specific adoption model used in this study, called the Extended TPB model, highlighting the inclusion of a number of additional constructs in studying IM adoption.

Technology Acceptance Model (TAM): Several different research streams provide theories to explain people's acceptance of technologies. The 'theory of reasoned action' and the 'theory of planned behavior' (Ibid) are early theories about people's general behavior. Based on these two theories, the 'technology acceptance model' (TAM) (Davis 1989) came about one of the most widely cited theories of users' acceptance of a technology (Patten, Sukeshini & Quentin 2007). The TAM theory suggests that users' behavioral intention (BI) to use a technology is affected by their perceived usefulness (PU) and perceived ease of use (PEOU) of the technology. Perceived usefulness was originally defined as the degree to which a person believes that using a particular system would enhance his or her job performance. It relates to job effectiveness, productivity (time saving) and the relative importance of the system to one's job. Perceived ease of use refers to ''the degree to which a person believes that using a particular system would be free of effort,'' in terms of physical and mental effort as well as ease of learning (Ibid). TAM also suggests that perceived usefulness is affected by perceived ease of use because, other things being equal, the easier a system is to use, the more useful it can be.

The Theory of Planned Behavior (TPB): The Theory of Planned Behavior (TPB) (Ajzen 2002) is an extension of the Theory of Reasoned Action (TRA). The TRA was related to voluntary behavior. Later on behavior appeared not to be completely voluntary and under control which resulted in the addition of perceived behavioral control. With this addition the theory was called the Theory of Planned Behavior. The theory of planned behavior predicts deliberate behavior, because behavior can be deliberative and planned. As a general rule, the more favorable the attitude and the subjective norm, and the greater the perceived control the stronger should the person's intention to perform the behavior in question (Ibid).

The Extended Theory of Planned Behavior (ETPB) Model: This section discusses one particular extended TPB model originally proposed by Pedersen & Nysveen (2003) to explain teenage adoption of text messaging services. In a study of college students gratification from using instant messaging services called ICQ (Leung 2001), seven gratifications termed "express affection", "entertainment", "relaxation", "fashion", "inclusion", "sociability" and "escape", were identified. It was found that female users used ICQ more than males, and that they use ICQ for sociability reasons while males use it more for relaxation and entertainment reasons. The ETPB contains 13 interrelated concepts. The applied concepts and relationships among them are shown in Figure 1 below, and definitions are presented in Appendix 'A'. In Figure 1 the dependent variables are shown by colored boxes.

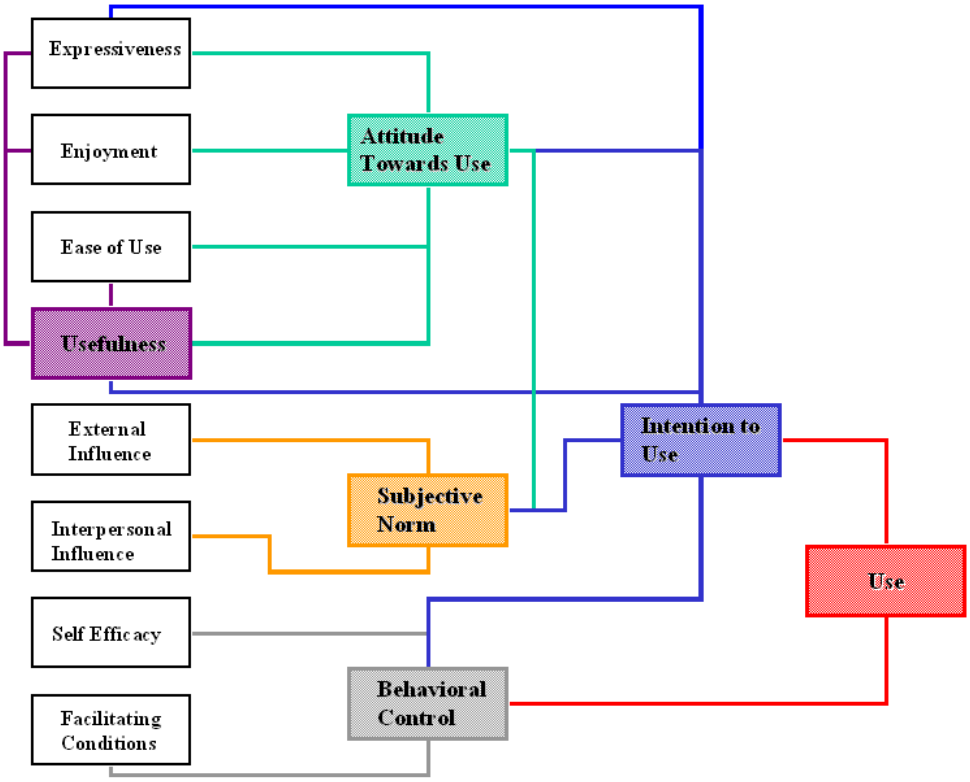

Figure 1: The Re-Specified & Extended TPB Model

Research Methodology

The main objective of this study is to explore the various factors involved in the adoption, by university students, of IM technologies using an extended model of the Theory of Planned Behavior (TPB) (Ajzen 2002). The secondary objective of this paper is to examine the various usage behaviours of students, such as the predominant usage activities, IM feature usage and intensity of use. More specifically, the research is aimed at understanding the character, function and styles of IM conversations among the sampled students. A number of aspects such as IM feature use, intensity of IM use and the number of contacts they maintain online, will be studied in relation to the character, functions and style of IM use by these students. This will enable understanding salient patterns of use among the students, and will drive further innovation in the development of this technology in the future. These over-arching objectives will lead us to the following research questions:

- Describe the character, function and style of IM use among university students, including the intensity of use, number of contacts maintained online and feature usage
- Examine the various usage behaviors of students including the character, functions, and style of IM use by university students

A quantitative questionnaire was developed, mainly informed by the Pedersen and Nysveen (2003) questionnaire for their study of text messaging service adoption, as well as the questions used by Davis (1989) for identifying factors that influence technology adoption. Based on the above questionnaires, the authors developed a set of questions that were specifically related to the IM usage. The questionnaire was then administered to a sample of students consisting of 80 students of Software Engineering at the University of New South Wales. The multiple regression analysis was used for analysis of the collected data. A summary of result from this analysis is demonstrated in the next section.

Results and Discussion

The multiple linear regression analysis was performed in order to describe the factors that influence IM use among university students (part of the first research question). In the first equation, the perceived expressiveness (EX), perceived enjoyment (E), perceived ease of use (EU), perceived usefulness (U), and subjective norm

(GSN) are taken as independent variables to determine their influence on users attitude (A) towards using the IM. Below is the result:

A = 0.6325 + 0.1081(EU) + 0.2199(U) + 0.2139(E) + 0.0090(EX) + 0.1612(GSN)

The above equation indicates that perceived usefulness and perceived enjoyment are the strongest explanatory variables in explaining the variance in attitudes (with regression coefficients 0.2199 and 2139 respectively. However, perceived expressiveness is not so strong (0.0090). The subjective norm on the other hand is another important explanatory variable but to a lesser degree when compared to the ease of use (0.1081). The R-squared adjusted value indicated that 52% of variance in attitudes could be explained. Analysis of the standardised residual values also showed that this model fits quite well with the data in justifying this value.

Due to page limitation, a summary of some of the equations driven from Figure 1 is shown in Table 1. This Table shows characteristics of the IM usage as related to the first part of the research question 1 (that is, describing characteristics of the IM use/adoption among university students).

Table 1: Summary of results from the regression analyses

Dependent Variable	Independent Variable	Independent Variable	Independent Variable	Independent Variable	Residuals normally distributed with zero mean? (Yes/No)
Perceived Usefulness R-squared: 0.48 A = + 0.0739	**Ease of Use** +0.3943	**Perceived Enjoyment** +0.2491	**Perceived Expressiveness** +0.2407		Yes
Subjective Norm R-squared: 0.38 A = + 1.8516	**External Influence** +0.0827	**Interpersonal Influence** +0.7043			Yes
Behavioral Control R-squared: 0.16 A = + 0.6191	**Self Efficacy** +0.4580	**Facilitating Conditions** +0.2180			Yes

The second research question was to describe functions and style of IM usage as well as various usage behaviours of students. The respondents were asked to answer a number of questions based upon the common Instant Messaging character, functions and pattern of use on a scale of 1 to 7, corresponding to extremely agree to extremely disagree for the purposes shown in Table 2. As shown, the mean scores for each purpose based on the data from all respondents lay between 2 and 3, indicating that overall respondents used IM for each of the purposes listed. Fairly small standard deviations and variance values indicates that the mean scores are a fairly accurate indicator of the mean values over the range of sample data.

Table 2: Character, Function, & Pattern of IM Use by Students

	Quick Questions/ Clarifications	Coordinating Impromtu Social Meetings	Coordinating & Scheduling Work Tasks	Collaborating with Classmates	Socialising	Multi-tasking	Staying in touch with classmates
Mean	2.197183	2.774648	2.619718	2.478873	2.774648	2.619718	2.492958
Std Dev	1.600176	1.868515	1.676443	1.680639	1.623023	1.767696	1.689237
Variance	0.728	0.673	0.639	0.677	0.585	0.674	0.678

And finally, respondents were asked about the intensity with which they use IM per day (related to the research question 2), and to indicate their usage on a scale corresponding to that shown in Table 3.

Table 3: Intensity of IM usage by Students

Hours per day	<1	1-2	2-3	3-4	4-5	5-6	>6
%	18	23	13	10	6	7	23

Respondents were also asked to indicate the number of contacts they maintained online, as a measure to describe to the size of their social networks online. The result can be seen in Table 4.

Table 4: Number of IM Contacts

No. of contacts	10-40	40-70	70-100	100-130	130-160	>160
%	32	20	20	14	7	7

It can be seen from Table 4 that 52% of respondents, had 70 or less online IM contacts that they maintained, with around 48 % having between 70 and 200 online IM contacts. It was found that 28 % of respondents had more than 100 online contacts. These results are fairly significant indicating that overall a large percentage of respondents indicated that they maintained a fairly extensive online network of IM contacts with a mean score for the entire sample of 75.8.

Respondents were also asked to indicate their usage of a number of IM features, in addition to basic text messaging. The common features that were offered by each of the three IM products (e.g., MSN Messenger, Yahoo Messenger, and ICQ) were selected, as well as a few addition features such as calendar sharing and whiteboard that were only offered by MSN. These two features were selected, as it was found that 85% of the respondents were MSN users, and these features were useful tools for coordination and scheduling as well as collaboration. Table 5 shows the relative percentage of users that indicated, they were users of each of the features selected. The main features used by the majority of respondents were the file transfer and "emoticons", both with 87.5% of respondents indicating they were users of this feature. The use of the integrated media features of video and voice chatting was also indicated as being quite significant features used, with 35% and 36.25% of respondents indicating their usage of these services. A significant percentage of respondents (38.75%) indicated that they played online games with their contacts, while using IM. Whiteboard was also a feature that was prominent among respondents with 26.25% of users indicated their use of this feature. However considering that on average respondents generally indicated that they used IM for collaborating and coordinating with classmates about course work, this seems like a fairly under utilized feature, as was calendar sharing to a greater extent, which is a useful tool that can used to exchange schedules.

Table 5: Distribution of IM Feature Usage by Students

Games	***Web Search***	***SMS***	***Voice Chat***	***Video Chat***	***File Transfer***	***Emoticons***	***Calendar Sharing***	***Whiteboard***
38.75%	10.00%	16.25%	36.25%	35%	87.50%	87.50%	2.50%	26.25%

Conclusion and Future Work

This research has provided some insights into adoption of IM technologies among university students. Understanding some of the key factors behind technology adoption is a pathway to better understand how to utilise the technology more effectively. This work is significant as there is limited work, done on applying the theories of adoption models to IM, so this study provides a good basis to extend research in this area. The research uses a less know adoption model that incorporates concepts, which may not have been considered in other studies. For example the concept of expressiveness proved to be a strong explanatory variable of users' attitudes and intentions for using IM. Intentions confirmed its place as a strong explanatory variable of usage. Also, a number of concepts proved to be less fruitful in this study, however this also serves a benefit to future studies. The study also noted some interesting patterns among university students usage of IM technology, such as the different purposes of use, level of usage and feature usage.

Future research could be undertaken to improve the reliability and consistency of the instrument used in this study, along with a larger sample size, to better understand some of the not so well explained concepts. Further research could also incorporate a study of a number of variables. A study of how sex, age, year of study and background of students, might be an interesting and insightful direction to extend this research. It may help to find patterns that could not be explained by this research. Further studies may also attempt to use more advanced statistical methods that may help analyse the data more accurately. This thesis could have benefited from incorporating qualitative methods to paint a richer picture. Interviews and discussion groups may have proven useful to clarify and compare the results and findings. Further studies could also study the character, functions

and patterns of IM usage in more detail, perhaps adopting a different methodology such as an ethnographic approach to compare the results from this study. Variable factors such as sex and age could be studied to see how IM usage differs.

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Appendix 1

Terms & Definitions

Perceived Ease of Use (PEU): The PEU refers to "the degree to which a person believes that using a particular system would be free of effort", in terms of physical and mental effort as well as ease of learning. Young users acquire "digital capital" becoming more skilled and experienced technology users and thus, ease of use may not be as important for these users as for other users (Pedersen & Nysveen 2003).

Perceived Usefulness: This is originally defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis 1989). This term has redefined by Pedersen & Nysveen (2003). By drawing upon uses and gratifications studies (Leung 2001; Leung & Wei 1998), the latter argue that the traditional concept of usefulness must be re-specified to include the motivations beyond effectiveness and efficiency. Motivations of accessibility, flexibility, sociability and security have all been mentioned in these studies. In addition, motivations of enjoyment, fashion and status and expressiveness have been mentioned.

Perceived Expressiveness: The PE is the ability to express style using a service. In addition, "text messaging services are communication services used to communicate at several levels, to demonstrate participation in social networks maintaining different roles, and to share and collect prior communication sessions" (Pedersen & Nysveen 2003).

Attitude Towards Use: Attitudes are generally believed to be the results of personal and social influences. The determinants such as usefulness, ease of use, enjoyment and expressiveness are determinants of attitudes as users perceive a service as fulfilling these gratifications, and consequently develop a positive attitude towards using it (Ibid).

External Influence: Young users may be more affected by external influence because their subjective norms are developing and changing. Also, they may be more exposed to the sources of external influence, such as general mass media, and they are more directly approached by advertising of a persuasive approach by terminal vendors and operators (Ibid).

Interpersonal Influence: This is the influence of others in developing norms that the use of a particular service is expected.

Subjective Norm: Subjective norms are the norms developed through external and interpersonal influence (Ajzen, 2002), and are influential in explaining the adoption and use of new media (Ibid). The question, however, is whether text messaging should be considered new media among young users. Research indicates that almost all teenagers in Norway have adopted text messaging, and many of the users now have considerable experience in using it (Ibid).

Self-Efficacy: It is the individual's confidence in that adoption of a service will lead to the desired behavior (Ibid). Determinants of self-efficacy are typically found in attributes of the individual adopter, such as experience, skills and education; and young users are generally believed to be among the more experienced and skillful users of text messaging services (Ibid).

Facilitating Conditions: A variety of conditions may facilitate or inhibit the use of mobile services. In general, a lack of facilitation is believed to reduce the perceived behavioral control of using a service or technology. Examples of such conditions are price, service and terminal availability, support, roaming and interconnect, security issues and service compatibility (Ibid).

Behavioral Control: The determinants of behavioral control are believed to be less important to young users than other users because of their experience and skill in using text messaging services and the facilitation of services supporting regular text messaging use offered by operators and service providers to the young user segment (Ibid). Financial resources and pricing, however, is indirectly believed to be an important determinant of behavioral control due to limited resources among young users (Ibid).

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