https://doi.org/10.48009/2_iis_2008_622-627

An Empirical Study of Instant Messaging Behavior Based on the Technology Assessment Model (TAM)

Alan R. Peslak, Penn State University, arp14@psu.edu

ABSTRACT

Instant messaging (IM) is an important form of synchronous electronic communications that has become extremely popular among teens and young adults. The communication offers unique advantages over email and other forms of communication but has not gained widespread support among corporate users. This study reviews instant messaging and its use and attempts to determine factors which influence its success. The Technology Acceptance Model (TAM), based on Davis's work (1989), is used to model IM behavior. Generally, the study finds that TAM does model IM behavior. Both perceived usefulness and perceived ease of use are positively associated with intention to use instant messaging. Other relationships are explored and a modified TAM model for IM is proposed. This study has important implications for researchers to further explore IM and TAM and for practitioners who can use this model to influence and popularize an important synchronous form of communication.

Keywords: Technology Acceptance Model, TAM, Instant Messaging, behavior, factor analysis, structural equation modeling

INTRODUCTION

The ability to communicate with anyone across the world has been made possible through electronic mail applications carried over the Internet telecommunications hub. This ubiquitous technology has become a standard in nearly all business organizations. But the ability to obtain instant electronic text communications across the world also has been developed. (Kay, 2003) Clearly, direct, instant communications across the globe can have unique advantages, yet many business organizations have been slow to adopt this technology. Instant messaging is a synchronous form of primarily text communications, whereby text messages can be exchanged between users by using a web-based client. This real time exchange of information has instilled instant messaging as one of the most popular forms of communications for teens and young adults today. The immediacy as well as the chance for real-time feedback has made this an accepted and rich means of exchange between individuals. The technology, as noted, is web-based and generally requires a web-based client either on a computer or other Internet enabled device (advanced cell phone, thin client, PDA). A user downloads a client to his Internet enabled device, creates an account with an IM provider such as AOL who acts as a intermediary for communications, and then signs in to this IM provider. By signing in, a user establishes a "presence" in the intermediary system. Other users of the system can be notified of the user's presence if these other users who are logged on to the system at that time have previously accepted and exchanged messages (becoming friends, "buddies" or some other such category). The application then shows individuals available with whom messages can be exchanged. This is followed by a selection of an individual with whom to communicate; the message is typed in an easy to use interface and sent. Responses are made easily through the interface as well. In this way, messages can be effortlessly exchanged between available friends. (Wilkins, 2007). Ilie, Van Slyke et al. (2005) likens it to a "private chat room".

Motivation for the study

Instant messaging has been accepted and embraced by the teen and young adult population. But the general and business population has been much slower to adapt to the technology. In May 2004 45% of all Internet users used the Internet for email but only 12% of internet users used the Internet for instant messaging (Rainie and Horrigan, 2005).

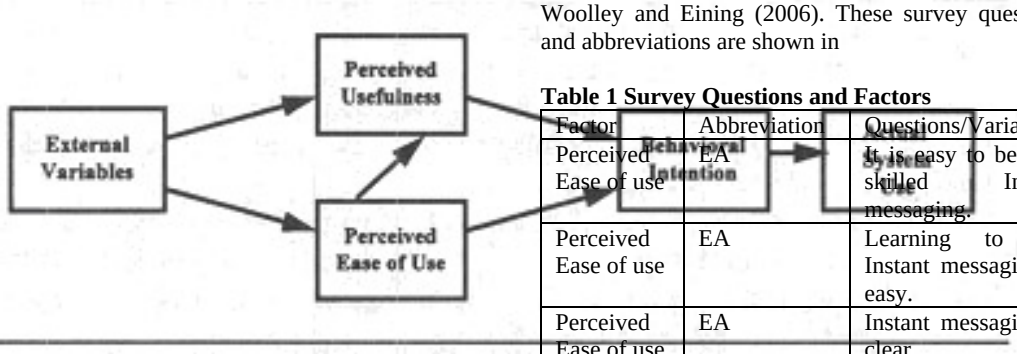
There are specific advantages to instant messaging which are not being reaped due to lower adoption. Specifically, users found that versus email instant messaging provided the advantages of "conveying emotions, building relationships, and ease of use" (Lancaster, Yen, Huang, and Hung, 2007). While nearly all companies use email, according to the AMA (2006) only 35% of organizations use instant messaging versus a near 100% use of email. There are advantages to instant messaging as a form of communication and there is a limited use among various user groups.

Technology Acceptance Model

One of the most important models for understanding adoption of information technology is the Technology Acceptance Model (TAM). The model was first proposed by Davis in 1989 and includes two key factors, perceived usefulness and perceived ease of use that are proposed to influence acceptance of a technology. According to Davis (1989) perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". Others have extended this definition to include overall task performance (Qui, Davis, and Gregory, 2003, Halawi and McCarthy, 2007, and Simon and Paper 2007)

Again according to Davis (1989) perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort". This is generally how easy the system or technology is to use. In an initial model, Davis, Bagozzi, and Warshaw (1989) suggested external variables as a key influencing variable but later Venkatesh and Davis (1996) have suggested that external variables are mediated by TAM and have not been included in our model. The original Technology Acceptance Model is illustrated in Figure 1 (Venkatesh and Davis, 1996). As noted, our model was used without the external variables.

Figure 1: Technology acceptance model.



HYPOTHESES

In order to determine the applicability of the Technology Acceptance Model to Instant Messaging behavior, a series of hypotheses were developed.

The model and factors explored include the original factors of the Davis (1989) work usefulness and ease of use and include two other factors from their later work, behavioral intention to use and actual system use (Venkatesh and Davis, 1996). The model used in this study closely follows the works of (Qui, Davis, and Gregory, 2003) as well as (Liu, Liao, and Peng, 2005).

Hypothesis one: Usefulness of Instant Messaging is Positively Associated with intention to use IM.

Hypothesis two: Ease of Use of Instant Messaging is Positively Associated with intention to use IM.

Hypothesis three: Ease of Use of Instant Messaging is Positively Associated with Usefulness of IM.

Hypothesis four: Intention to use Instant Messaging is Positively Associated with use of Instant Messaging.

Hypothesis five: Instant Messaging technology will provide a TAM model fit for behavioral intention and behavior.

METHODOLOGY

A survey was prepared and pre-tested with a small group of students at a northeastern US university. The survey was modified based on preliminary tests and administered to 128 students at a small southeast US university. The survey was a comprehensive survey of instant messaging behavior. A subset of this study was specific questions which developed TAM factors.

For each of the factors, survey questions were patterned after prior research. Ease of use, usefulness, and intention factor questions were modeled after Davis (1989), intention was based on Venkatesh and Morris (2000), and behavior was based on common usage terminology and piracy behavior factor in Woolley and Eining (2006). These survey questions and abbreviations are shown in

Table 1 Survey Questions and Factors

Factor	Abbreviation	Questions/Variables
Perceived Ease of use	EA	It is easy to become skilled Instant messaging.
Perceived Ease of use	EA	Learning to use Instant messaging is easy.
Perceived Ease of use	EA	Instant messaging is clear and understandable
Perceived Ease of use	EA	Instant messaging is flexible.
Perceived Ease of use	EA	Instant messaging is easy to do.
Perceived Usefulness	USEF	I find Instant messaging useful.
Perceived Usefulness	USEF	I can improve my performance by Instant messaging.
Perceived Usefulness	USEF	I can accomplish things more quickly by Instant messaging.
Perceived Usefulness	USEF	I can enhance my effectiveness by Instant messaging
Perceived Usefulness	USEF	I can improve my productivity by Instant messaging
Behavioral Intention	INTENTION	I predict I will use Instant messaging
Behavioral Intention	INTENTION	I intend to use Instant messaging
Behavioral Intention	INTENTION	I plan to use Instant messaging
Actual System Use	USE	I plan to use Instant messaging in the

		future.
Actual System Use	USE	I currently use Instant messaging.
Actual System Use	USE	I will continue to use Instant messaging.

The overall demographics of the group reflected the student population with 96% of the participants between the ages of 18 and 24. The gender mix was slightly skewed with a 64% female participation.

The questions measured a five point Likert scale with level of agreement from 1 = strongly agree to 5= strongly disagree.

SPSS 16 and AMOS 16 were used to analyze the data and test the proposed hypotheses. Factor analysis and scale reliability as well as structural equation modeling were conducted similar to Wooley and Eining (2006), and Moore (2000).

RESULTS

Confirmatory factor analysis and scale reliability testing was used to determine the factors used in the model. All the factors were confirmed with one component determined and eigenvalues over 1.0 which is generally seen as the level of acceptability. (Moore, 2000). The Ease of use five questions resulted in one component with an eigenvalue over 1.0 at 3.601. The component matrix elements all were above .5 (minimum acceptable, Moore, 2000) and scale reliability provided a Cronbach's alpha of .874, well above the minimum acceptable of .7 (Nunnally, 1978).

The five Usefulness questions also resulted in one factor with an eigenvalue over one, at 3.934. All components were over .5 and Cronbach's alpha was .892. As noted, these are all well above minimum levels.

Intention and its three variables clearly resulted in one factor with an eigenvalue over one, at 2.941. All components were over .98 and Cronbach's alpha was at .99. These were certainly above minimum levels.

Finally, actual behavior was measured by three variables and it demonstrated one factor with an eigenvalue over 1.0, at 2.701. All components were over .93 and Cronbach's alpha was .94. In all cases and by all measures all factors met acceptable levels.

Once the factors were determined, the results were analyzed in AMOS 16.0 to test the hypotheses and develop the model using structural equation modeling.

The results of the analysis are shown in the tables below. The model is shown in figure 2.

Table 2 Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
usef	<---	ea	.259	.087	2.992	.003	
intention	<---	usef	.398	.071	5.645	***	
intention	<---	ea	.417	.070	5.914	***	
use	<---	intention	.869	.044	19.682	***	

Hypothesis one: Usefulness of Instant Messaging is Positively Associated with intention to use IM.

As shown in table 2, usefulness was positively associated with intention to use instant messaging with a intention to use Instant messaging. This correlation was significant at the p<.001 level. The coefficient was .398. Usefulness of instant messaging did have an impact on intention to use IM.

Hypothesis two: Ease of Use of Instant Messaging is Positively Associated with intention to use IM.

Similarly, ease of use was found to have a positive and significant correlation with intention to use IM. This association was found to be at p<.001 as well with a coefficient of a slightly higher .417. Ease of use does have an impact on intention to use IM.

Hypothesis three: Ease of Use of Instant Messaging is Positively Associated with Usefulness of IM.

Venkatesh and Davis (1996) have proposed an association between ease of use and usefulness. Our study found that ease of use did have a significant positive impact on ease of use at p<.003.

Hypothesis four: Intention to use Instant Messaging is Positively Associated with use of Instant Messaging.

The Venkatesh and Davis (1996) included an association between intention and use. The Theory of Reasoned Action model of Ajzen and Fishbein (1980) though using different influencing factors does include a key model association between intention to use and actual behavior. Many researchers (Gupta and Kim, 2007, Shimp and Kavas, 1984, Tarkiainen and Sundqvist, 2005) have supported this association. With an objective to study and improve overall behavior, it was important that this relationship was established. Our study found a strong association with a .869 coefficient and significance at p < .001.

Hypothesis five: Instant Messaging technology will provide a TAM model fit for behavioral intention and behavior.

The inclusion of all factors into a comprehensive model was tested via AMOS 16.0. The model provided an acceptable overall fit and is illustrated in chart 2. The RMSEA is .055, below the recommended .06 (Hu and Bentler, 1999); the chi square divided by the degrees of freedom is below 3 at .1.4 (Moore, 2000). The chi-square value of 2.76 with two degrees of freedom is non-significant at the .05 level: its p-value is .252. These findings suggest that the model fits the data acceptably in the population from which the sample was drawn. Hypothesis five was supported. The modified Technology Acceptance Model is an acceptable model for Instant Messaging behavior. The standardized regression weights and squared multiple correlations are presented in tables 3 and 4.

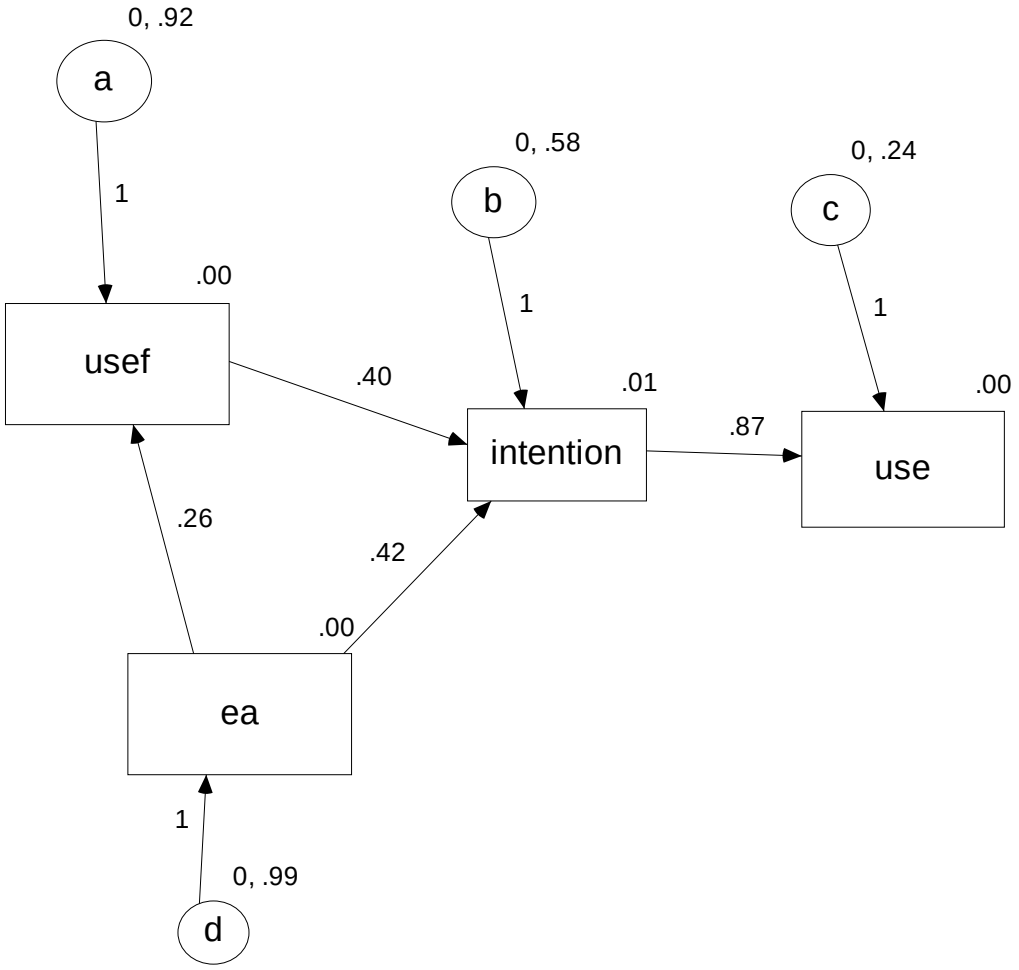


Figure 2 Modified Technology Acceptance Model with Estimates

Table 3 Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
usef	<---	ea	.259
intention	<---	usef	.399
intention	<---	ea	.417
use	<---	intention	.868

Table 4 Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
ea	.000
usef	.067
intention	.418
use	.754

LIMITATIONS AND DISCUSSION

As with any study there are limitations to this study. First, the study examines primarily traditional students at one undergraduate university location. Results ought to be replicated across other locations to confirm the preliminary findings of the study. Also, only students were studied. Though this group does represent a population of significant users, results may be different with non-students or with other age groups. Another limitation is the sample size. Though sizable, the number of participants can be increased to improve reliability. Finally, the study only examines the use of one model of human behavior. Though support for the Technology Acceptance Model has been demonstrated, there are other models which could be tested.

IMPLICATIONS AND DISCUSSION

Overall it has been demonstrated that a modified Technology Acceptance Model can serve as a model for instant messaging behavior. Research has shown that instant messaging provides exclusive advantages over other electronic communications methods including email. But, instant messaging is used much less frequently in both individual and business usage. Understanding the factors associated with intention and behavior associated with instant messaging can focus efforts to increase instant messaging usage.

First, it was shown that intention to use instant messaging is positively and significantly affected by perceived usefulness of instant messaging. It has been suggested that use of a technology can be improved if users are educated about the benefits of the technology.(Xu and Paulins, 2005 and Bang, Ellinger, Hadjmarcou, and Traichal, 2000). Training in the workplace or in colleges or high schools on the benefits and advantages of instant messaging can allow greater use of this technology and improve overall communications. As a result, significant positive cost and productivity improvements for businesses and organizations are possible.

The second finding is that ease of use is significantly and positively associated with intention to use IM. New releases of instant messaging software have made the technology extremely easy to use and this feature needs to be demonstrated to organizations and individuals. This can spur growth and use of the technology. In addition, ease of use was found to affect usefulness, again an area that can easily be demonstrated to potential users to spur usage.

The study clearly demonstrated as well that intention to use IM does lead to actual use of IM. Thus, all efforts to influence intention will have the desired affect of increasing actual usage.

Finally, all these factors fit together in a workable, usable model which can be the basis for further research in technology acceptance. Use of TAM with consumer technology has been limited and as a result of this study, the model can be tested for other user interface and consumer device acceptance and usage.

CONCLUSION

Overall this study has provided significant factors that influence and model instant messaging intention and behavior. We see this as the start of an exploration of ways to increase and improve penetration of this valuable communications technology. Studies can be developed to confirm these findings with larger and more diverse sample groups, but preliminary findings suggest that instant messaging does adhere to the modified technology acceptance model and is thus subject to efforts to improve behavior through attention to the significant influencing factors of ease of use, usefulness and behavioral intention. Overall, this is a fertile research area that deserves further attention.

REFERENCES

1. Ajzen, I. and Fishbein, M.(1980), *Understanding Attitudes and Predicting Social Behavior*, Englewood Cliffs, NJ: Prentice-Hall,Inc.

2. AMA (2006) Workplace E-Mail, Instant Messaging & Blog Survey: Bosses Battle Risk by Firing E-Mail, IM & Blog Violators. Available at: http://www.amanet.org/press/amanews/2006/blogs_2006.htm

3. Bang, Ellinger, Hadjimarcou, and Traichal (2000). Consumer concern, knowledge, belief, and attitude toward renewable energy: An application of the reasoned action theory. *Psychology & Marketing*, 17 (6) 449+.

4. Davis, F., Bagozzi, R., and Warshaw, P. (1989) User Acceptance of Computer Technology: A

Comparison Of Two. *Management Science*, 35 (8) 982+.

5. Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of
6. Information Technology, *MIS Quarterly*, (13), 319-340.

7. Gupta and Kim (2007) Developing the Commitment to Virtual Community: The Balanced Effects of Cognition and Affect, *Information Resources Management Journal*, 20(1), 28-45.

8. Halawi and McCarthy (2007) Measuring faculty perceptions of blackboard using the technology acceptance model. *Issues in Information Systems*, 8(2), 160-165.

9. Hu, L. and Bentler, P. M. (1999), "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives", *Structural Equation Modeling*, 6(1), 1-55.

10. Ilie, V., Van Slyke, C., Green, G., and Lou, H. (2005). Gender Differences in Perception and Use of Communication Technologies.: A Diffusion of Innovation Approach, *Information Resources Management Journal*, 18(3), 13-31.

11. Kay, R. (2003) QuickStudy: Presence Technology. Available at: http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=79060

12. Lancaster, Yen, Huang, and Hung (2007) The selection of instant messaging or e-mail; College students' perspective for computer communication. *Information Management & Computer Security*. 15(1), 5-10.

13. Liu, Liao, and Peng (2005) Applying The Technology Acceptance Model And Flow Theory To Online E-Learning Users' Acceptance Behavior. *Issues in Information Systems*. 6 (1/2), 175-181

14. Moore (2000) One road to turnover: An examination of work exhaustion in technology professionals *MIS Quarterly*, 24(1), 141-167.

15. Nunnally, J.C. (1978), *Psychometric Theory*.

New York: McGraw-Hill.

16. Qui, Davis and Gregory (2003) Student Attitudes Toward Web-Based Course Management System Features, *Issues in Information Systems*, 4, 672-678.

17. Rainie and Horrigan (2005) A decade of adoption: How the internet has woven itself into American life. Available at: http://www.pewinternet.org/pdfs/Internet_Status_2005.pdf

18. Shimp and Kavas (1984) The Theory of Reasoned Action Applied to Coupon Usage, *The Journal of Consumer Research*, 11(3), 795-809.

19. Simon and Paper (2007) User Acceptance of Voice Recognition Technology: An Empirical Extension of the Technology Acceptance Model, *Journal of Organizational and End User Computing*, 19(1), 24-50.

20. Tarkiainen and Syundqvist (2005) Subjective norms, attitudes and intentions of Finnish consumers in buying organizations, *British Food Journal*, 107 (10/11), 808-822.

21. Venkatesh and Davis (1996) A model of the antecedents of perceived ease of use: Development and test, *Decision Sciences*, 27(3) 451-480.

22. Venkatesh, V. and Morris, M. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior, *MIS Quarterly*, 24 (1), 115-129.

23. Wilkins, J. (2007) RU READY FOR IM? *Information Management Journal*, 41(3), 27-31.

24. Woolley and Eining (2006) Software Piracy among Accounting Students: A Longitudinal Comparison of Changes and Sensitivity, *Journal of Information Systems*, 20 (1), 49-63.

25. Xu and Paulins (2005). College students' attitudes toward shopping online for apparel products: Exploring a rural versus urban campus, *Journal of Fashion Marketing and Management*, 9 (4), 420-433