Personal, Social and Organizational factors in usage of Collaboration Systems for Research

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ABSTRACT

This paper attempts to investigate the relationship between personal, social and organizational factors with the usage of collaborative systems for research. The target population for this study is the academic staffs of Malaysia research universities. The personal related factors are personal innovativeness and task-technology-fit whereas the social factors are subjective norm and peer acceptance. The organizational factors are training and management support. The relationship of these three perspectives (i.e. personal, social and organizational) in relation with usage of collaborative systems is studied using a model adapted from Technology-Organization-Environment (TOE) model and incorporating it with the Technology Acceptance Model (TAM). Data analysis presents the descriptive statistics of the respondents, the reliability and validity of the instruments used and correlational analysis of the factors. In conclusion, this paper proposes a framework incorporating these factors that are important in influencing usage of collaboration systems for academic research.

Keywords: Collaborative systems, Technology-Organization-Environment (TOE) model, Technology Acceptance Model (TAM).

I INTRODUCTION

In general, collaborative systems unite two or more researchers through computer mediated communications (CMC) such as email or online database and other related collaborative tools in order for these researchers to work together on a research project. The technology may assist the group by providing calculation tools, text authoring or graphical design tools, communications medium or as database to maintain the group's memory and data storage needs.

In the present day, the usage of these systems is gradually taking over face-to-face interaction in collaborating for research. The degree of usage of collaborative systems for research may be influenced by personal, social or organizational factors.

The importance of e-collaboration tools for research is clear because e-collaboration would add on to face-to-face collaborations resulting in more research productivity. The usage of collaborative systems for research may significantly increase research productivity (Ynalvez & Shrum, 2011). Researchers from around the globe may now easily share ideas, documents and knowledge to work in a research project. Usage of these systems becomes more important as the distance between the researchers increases (Ahmad Fauzi, 2004).

The TAM model shown in Figure 1 is widely used to study the acceptance or usage of many kinds of systems. While much of TAM research had focused on many independent variables, this study is unique in that it incorporates the TOE model to the TAM model to specifically group the independent factors into personal, social and organizational perspectives thus producing a new hybrid framework to study systems usage as illustrated in Figure 2. Secondly, this study uses this hybrid research model to investigate factors related to usage of collaborative systems for research.

II LITERATURE REVIEW

Electronic collaboration or e-collaboration can be considered the parent term to related fields of groupware, computer-supported cooperative work, group decision support system, collaboration technologies and knowledge management (Kock et al., 2001). The collaborative systems that are mainly used for e-collaboration includes email, Web-based chat, Web-based document sharing (e.g. Google Docs), group writing software, videoconferencing and others.

A. A framework in studying collaborative systems usage for research

Technology acceptance model (TAM) (Davis et al., 1989) is a research model widely used to investigate the factors of acceptance/usage of computer systems by individual users.

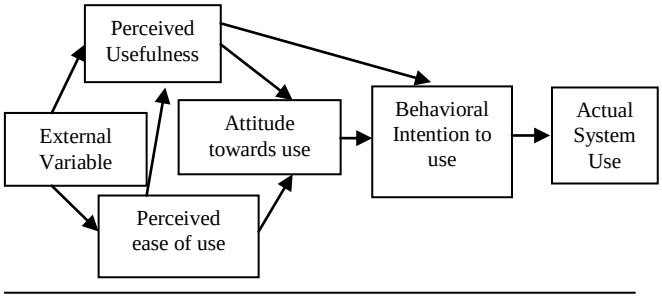

Figure 1. Technology Acceptance model

In essence, the TAM model incorporates the relationship of independent variables or called external variable in the model with user's perceived usefulness and perceived ease of use of a system. These two factors then relate to the user's intention to use the system or actual usage of the system. The external factors used in this study are grouped into three dimension of personal, social and organizational based on the technology-organizational-environment (TOE) model that was developed by Tornatzky and Fleischer (1990). An example of this model being adapted in the area of technology adoption and usage is the study by Zhu & Kraemer (2005) in studying e-commerce usage.

B. Personal, Social and Organizational factors

The personal related factors are personal innovativeness and task-technology-fit whereas the social factors are subjective norm and peer acceptance. The organizational factors are training and management support. The definitions of these factors are given in Table 1.

Table 1. Construct definitions

Construct name	Definition
TTF	The degree to which the collaborative systems assist an individual in performing his or her tasks of collaborative with peers.
Personal innovative in IT	The degree of innovative tendency and adoption speed of a user to adopt IT
Managerial support	The degree to which management assists users on the usage of collaborative systems
Training	The extent to which management organizes internally or externally provided formal training and support for users on the usage of collaborative systems
Perceived Peer acceptance	The degree of one's perception that one's peers or colleagues are also using the collaborative system
Subjective norm	The degree of one's perception that other people considered important by the person think he or she should use collaborative systems

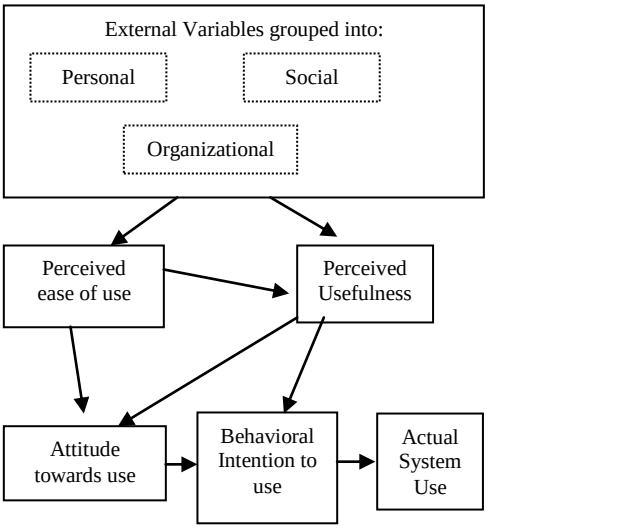

Figure 2. The adaptation of TOE model groups the external variables in TAM

III METHOD

The population of this study is all the academic staffs of research universities in Malaysia who have at least collaborated and co-authored a high impact journal paper. High impact journals as defined by the Malaysia Ministry of Higher Education (MOHE) are journals and refereed proceedings that are citation-indexed by SCOPUS /ISI /IEEE /SCI /SSCI/ AI).

The questionnaires (attached with photocopies of recommendation letters from MOHE and/or assistant vice chancellor of academic affairs) were distributed via the particular university's internal mail system to a random sample of the targeted population of academic staffs of Malaysian research universities. Participation was on a voluntary basis. All of the constructs were measured using a 7-point Likert scale questionnaire format. Demographic data on gender, age, academic rank, experience using collaborative systems for research and years of experience as an academic researcher were also asked. A soft reminder via email was sent after about two weeks from the initial distribution.

IV ANALYSIS OF FINDINGS

A descriptive and correlation analysis were calculated and analyzed for each of the factors under study in order to investigate their importance. Reliability test of the constructs using SPSS Cronbach's Alpha analysis and validity test using factor analysis were done.

A. DESCRIPTIVE ANALYSIS

Data were collected from 21 respondents. This study at the time of writing up this paper was still on-going and therefore may explain the small number of respondents analyzed in this paper.

Table 2 summarizes the demographic data of the respondents. The sample consists of mostly male respondents (62%). Most belong to the age group of 40-50 (57 percent), most are at the academic rank of Associate Professor (43 percent) and most have an education level at the Doctorate level (76 percent).

Table 2. Demographic Statistics

Demographic profiles	n	%
Gender		
Female	8	38
Male	13	62
Age		
30-39	5	24
40-50	12	57
>50	4	19
Academic rank		
Professor	5	24
Associate Professor	9	43
Senior Lecturer	7	33
Education		
Post Doctorate	4	19
Doctorate	16	76
Master	1	5

In determining the reliability of the instruments used in this study, the Cronbach alphas were calculated for each of the constructs. In order for an instrument to be a reliable measure of a construct, Nunnally (1978) recommended the Cronbach alpha to be more than 0.6. Referring to Appendix 1, the Cronbach alphas are all more than 0.6. In general, the instruments are reliable and that the data collected could be thus used for analysis.

The validity of an instrument also need be tested using principal components factor analysis with Varimax rotation. This is to ensure that all items for a construct actually measure the construct. Appendix 2 shows the result of the factor analysis. For all the constructs, all items loaded on a distinct factor indicating a distinct uni-dimensional scale. All factor loadings for all variables were greater than 0.5 with eigenvalues greater than 1.0 and percentage range of between 69%-84% of the total variance explained.

Table 3 summarizes the correlation matrix. TTF has significant moderate positive correlation with Peer acceptance, Training, Subjective norm and Personal innovativeness. Training and Personal innovativeness has a moderate positive correlation. Peer acceptance and Subjective norm too has a positive correlation.

Table 3. Correlation matrix

	TTF	PI	MS	Training	PA	SN
TTF		.642**	.179	.513*	.561**	.678**
PI	.624**		-.085	.544*	.238	.344
MS	.179	-.085		.187	-.93	.225
Training	.513*	.544*	.187		.110	.344
PA	.561**	.238	-.93	.110		.581**
SN	.678**	.344	.225	.344	.581**	

Notes: *Correlation is significant at the 0.05 level; **correlation is significant at the 0.01 level. PI= Personal innovativeness; MS= Management support; PA=Peer acceptance; SN=Subjective norm

V CONCLUSION

From the reliability and validity tests done on this sample of respondents, the instruments conform to recommended levels to be considered reliable and valid instruments.

The main contribution of this paper is the hybrid research model that combines the important features of the TAM and TOE model. The resulting model proposes a more balance analysis on factors that may relate to usage of systems. The model breaks the independent variables into groups of personal, social and organizational perspectives.

Future work involves data analysis on the relationships of these independent variables with actual usage of collaborative systems and the relationship between usage and performance in research.

VI ACKNOWLEDGEMENTS

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APPENDIX A

Construct/Scale	Mean	SD	Cronbach's Alpha
Task Technology Fit			0.879
Ease of locating content	4.76	1.044	
Ease of use (item 1)	5.29	.902	
Ease of use (item 2)	5.14	1.062	
Meaning of data (item1)	4.90	.831	
Meaning of data (item 2)	4.95	.865	
Personal Innovativeness			0.919
Exploration	5.047	1.117	
Experiment	4.905	1.179	
First to try out	4.191	1.470	
Speed to try out	4.762	1.513	
Management support			0.920
Awareness of benefits	5.19	1.078	
Encouragement of use	5.14	1.062	
Provides necessary resources	4.76	1.091	
Provides access to various systems	4.90	1.091	
Recognizes usage efforts	4.81	1.030	
Importance to management	5.00	1.000	
Training			0.938
Assistance availability	4.05	1.532	
Specialized training	3.95	1.564	
Training completeness	3.86	1.459	
Improved understanding	4.10	1.446	
Provide confidence	4.14	1.389	
Adequate in terms of detail.	4.05	1.396	
Peer acceptance			0.885
Peers' extent of usage	5.14	.910	
Peers' communication usage	5.14	1.014	
Peers' document transfer usage	5.24	.995	
Peers' shared document usage	5.05	.973	
Subjective norm			0.925
Perception of those opinion valued	5.24	1.044	
Perception of important colleagues	5.10	.995	
Perception of superiors	5.33	.966	
Perception of subordinates	5.24	.995	

APPENDIX B

Principal component with Varimax Rotated Factor Loadings Matrix for Training construct

Scale items	*Factor*
Assistance availability	.798
Specialized training	.798
Training completeness	.863
Improved understanding	.939
Provide confidence	.921
Adequate in terms of detail.	.943
Eigenvalue	4.637
Variance (%)	77.28

Principal component with Varimax Rotated Factor Loadings Matrix for TTF construct

Scale items	*Factor*
Ease of locating content	.557
Ease of use_item1	.909
Ease of use_item2	.890
Meaning of data_item1	.872
Meaning of data_item2	.880
Eigenvalue	3.464
Variance (%)	69.274

Principal component with Varimax Rotated Factor Loadings Matrix for Personal Innovativeness construct

Scale items	*Factor*
Exploration	.946
Experiment	.962
First to try out	.858
Speed to try out	.868
Eigenvalue	3.311
Variance (%)	82.77

Principal component with Varimax Rotated Factor Loadings Matrix for Subjective Norm construct

Scale items	*Factor*
Perception of those opinions valued	.931
Perception of important colleagues	.936
Perception of superiors	.870
Perception of subordinates	.878
Eigenvalue	3.27
Variance (%)	81.76

Principal component with Varimax Rotated Factor Loadings Matrix for Management Support construct

Scale items	*Factor*
Awareness of benefits	.795
Encouragement of use	.880
Provides necessary resources	.855
Provides access to various systems	.885
Recognizes usage efforts	.815
Importance to management	.842
Eigenvalue	4.29
Variance (%)	71.5

Principal component with Varimax Rotated Factor Loadings Matrix for Peer Acceptance construct

Scale items	*Factor*
Peers' extent of usage	.816
Peers' communication usage	.957
Peers' document transfer usage	.917
Peers' shared document usage	.971
Eigenvalue	3.36
Variance (%)	84.15