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USING PARTIAL LEAST SQUARE METHOD TO ASSESS THE IMPACTS OF DETERMINANTS ON CONTINUANCE INTENTION TOWARDS SELF-SERVICES TECHNOLOGIES

Shih-Chih Chen^{1*} and Chih-Chun Kung²

*Corresponding Author: **Shih-Chih Chen**, ✉ scchendr@mail.stust.edu.tw

Self-Service Technologies (SSTs) can offer services by consumers or users themselves on the Internet and Websites. Types of SSTs include ATMs, interactive kiosks, online financing and so on. This study integrated relationship quality and the antecedents of Technology Acceptance Model (TAM) with Theory of Planned Behavior (TPB) to form a research model to understand and predict the users' continuance intention toward self-service technologies. We used partial least square method to analyze the empirical data. This study found that the antecedents of TAM and TPB had the significant influences on continuance intention through relationship quality. There are few studies to discuss the impact of relationship quality from the acceptance of novel technologies. Finally, we proposed the suggestions and managerial implications for academic researchers, practicers and SSTs' system designers.

Keywords: Self-service Technology, Technology Acceptance Model, Theory of Planned Behavior, Relationship Quality

INTRODUCTION

Self-Service Technologies (SSTs) can offer services by consumers or users themselves on the Internet and Websites. Types of SSTs include ATMs, interactive kiosks, online financing and so on. This study integrated relationship quality and the antecedents of Technology Acceptance Model (TAM) with Theory of Planned Behavior (TPB) to form a research model to understand and predict the users' continuance intention toward self-

service technologies. We used partial least square method to analyze the empirical data. This study found that the antecedents of TAM and TPB had the significant influences on continuance intention through relationship quality. There are few studies to discuss the impact of relationship quality from the acceptance of novel technologies. Finally, we proposed the suggestions and managerial implications for academic researchers, practicers and SSTs' system designers.

¹ Department of Accounting Information, Southern Taiwan University of Science and Technology, No. 1, Nan-Tai Street, Yung Kang Dist., Tainan City 710, Taiwan

² Institute of Poyang Lake Eco-economics, Institute of Eco-civilization & economics, Jiangxi University of Finance and Economics, No. 168, East Shuanggang Road, Nanchang City, Jiangxi Province 330013, China

LITERATURE REVIEW

Technology Acceptance Model

Davis (1989) proposed the TAM to model how users use and accept an Information Technology (IT) or Information System (IS) (as shown in Figure 1). This model is one of the most influential theories in the IT/IS literature. TAM has two important factors, notably:

- Perceived usefulness: The degree to which an individual believes that adopting a particular IT/IS would enhance his/her performance or productivity.
- Perceived ease-of-use: The degree to which an individual believes that adopting a particular IT/IS would be free of effort.

This study presented the relevant literature based on TAM to understand its' stability and applicability from the technology acceptance viewpoint (as shown in Table 1).

Theory of Planned Behavior

Ajzen (1991) proposed the TPB. The concept of TPB was to improve on the predictive power of Fishbein and Ajzen (1975)'s theory reason action by adding perceived behavioral control. TPB expresses three determinants including attitude towards behavior, subjective norms and perceived behavioral control (Figure 2).

This study presented the relevant literature based on TPB to understand its' stability and applicability (Table 2).

Relationship Quality

Relationship quality is an assessment of relationship quality between the company and customers. Crosby *et al.* (1990) is the first publication to propose the concept model of relationship quality. However, there are consensus opinions to regard the factors that make up relationship quality. Crosby *et al.* (1990), Leuthesser (1997), Tam and Wong (2001), Lin and Ding (2005), Lin and Ding (2009), Kim *et al.* (2009), Zhang *et al.* (2011), and Chen (2012) deemed that relationship quality consisted of satisfaction and trust. However, more empirical studies suggested that relationship quality included satisfaction, trust and commitment (e.g., Smith, 1998a; Smith, 1998b; Garbarino and Johnson, 1999; Hsieh *et al.*, 2002; Wulf *et al.*, 2001; Farrelly and Quester, 2005; Rauyrueen and Miller, 2007; Athanasopoulou, 2009; Moliner, 2009; Sanchez-Franco *et al.*, 2009; Walsh *et al.*, 2010; Vesel and Zabkar, 2010; Pierre *et al.*, 2010).

Therefore, this study assumed that enhanced relationship quality is comprised by increased satisfaction, trust, and commitment.

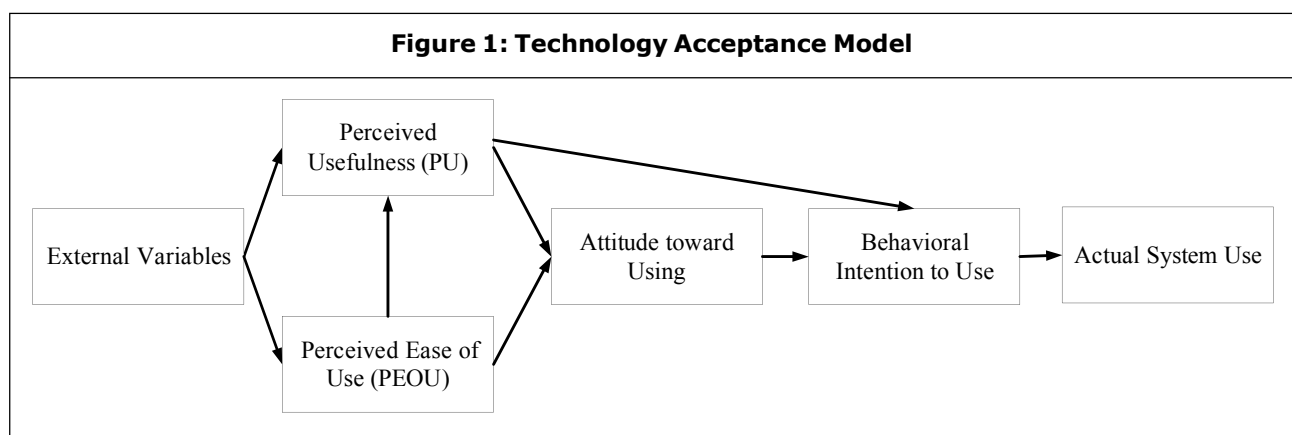


Table 1: Relevant TAM Studies in Recent Years

Author	Research topic	Source
Hasan B and Ahmed, M U (2007).	Effects of interface style on user perceptions and behavioral intention to use computer systems.	<i>Computers in Human Behavior</i> , Vol. 23, No. 6, pp. 3025-3037.
Liao C, Chen J L and Yen D C (2007)	Theory of planning behavior (TPB) and customer satisfaction in the continued use of e-service: An integrated model.	<i>Computers in Human Behavior</i> , Vol. 23, No. 6, pp. 2804-2822.
Bienstock, C., Royne, M., Sherrell, D., & Stafford, T. (2008).	An expanded model of logistics service quality: Incorporating logistics information technology.	<i>International Journal of Production Economics</i> , 113(1), 205-222.
Chen H H and Chen S C (2009)	The empirical study of automotive telematics acceptance in Taiwan: Comparing three technology acceptance models.	<i>International Journal of Mobile Communications</i> , Vol. 7, No. 1, pp. 50-65.
Chen S C, Chen H H and Chen M F (2009)	Determinants of satisfaction and continuance intention towards self-service technologies.	<i>Industrial Management & Data Systems</i> , Vol. 109, No. 9, pp. 1248-1263.
Ha S and Stoel L (2009)	Consumer e-shopping acceptance: Antecedents in a technology acceptance model.	<i>Journal of Business Research</i> , Vol. 62, No. 5, pp. 565-571.
Kim S and Garrison G (2010)	Investigating mobile wireless technology adoption: An extension of the technology acceptance model.	<i>Information Systems Frontiers</i> , Vol. 11, No. 3, pp. 323-333.
Shyu S H P and Huang J H (2011)	Elucidating usage of e-government learning: A perspective of the extended technology acceptance model.	<i>Government Information Quarterly</i> , Vol 28, No. 4, pp. 491-502.
Zhang P, Li T, Ge R and Yen D C (2012)	A theoretical acceptance model for computer-based communication media: Nine field studies.	<i>Computers in Human Behavior</i> , Vol. 28, No. 5, pp. 1805-1815.
Cheng Y M (2012)	Effects of quality antecedents on e-learning acceptance.	<i>Internet Research</i> , Vol. 22, No. 3, pp. 361-390.
Camarero C, Rodríguez J and José R S (2012)	An exploratory study of online forums as a collaborative learning tool.	<i>Online Information Review</i> , Vol. 36, No. 4, pp. 568-586.
Kashi K and Zheng C (2013)	Extending technology acceptance model to the e-recruitment context in Iran.	<i>International Journal of Selection and Assessment</i> , 21(1), 121-129.
Park E and del Pobil A P (2013)	Extending the technology acceptance model in remote pointing technology: identifying the role of perceived mobility and control.	<i>Sensor Review</i> , 33(1), 40-47.

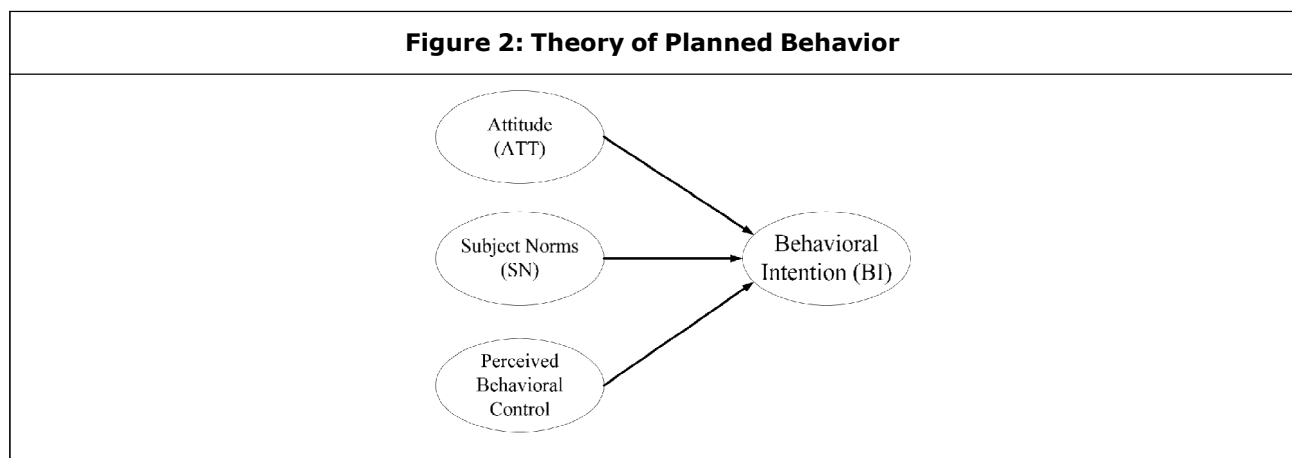


Table 2: Relevant TPB studies in recent years

Author	Research topic	Source
Lee Y and Kozar K A (2008)	An empirical investigation of anti-spyware software adoption: A multitheoretical perspective.	<i>Information & Management</i> , Vol. 45, No. 2, pp. 109-119.
Khalifa M and Shen K N (2008)	Drivers for transactional B2C m-commerce adoption: extended theory of planned behavior.	<i>Information Systems Journal</i> , Vol. 48, No. 3, pp. 111-117.
Crespo A H and Rodríguez Del Bosque Rodríguez I A (2008)	Explaining B2C e-commerce acceptance: An integrative model based on the framework by Gatignon and Robertson.	<i>Interacting with Computers</i> , Vol. 20, No. 2, pp. 212-224.
Pelling E L and White K M (2009)	The theory of planned behavior applied to young people's use of social networking Web sites.	<i>Cyber Psychology & Behavior</i> , Vol. 12, No. 6, pp. 755-759.
Ramayah T, Rouibah K, Gopi M and Rangel G H (2009)	A decomposed theory of reasoned action to explain intention to use Internet stock trading among Malaysian investors.	<i>Computers in Human Behavior</i> , Vol. 25, No. 6, pp. 1222-1230.
Lee M C (2009)	Predicting and explaining the adoption of online trading: An empirical study in Taiwan.	<i>Decision Support Systems</i> , Vol. 47, No. 2, pp. 133-142.
Pelling E L and White K M (2009)	The theory of planned behavior applied to young people's use of social networking web sites.	<i>Cyber Psychology & Behavior</i> , Vol. 12, No. 6, pp. 755-759.
Canniere M H D, Pelsmacker P D and Geuens M (2009)	Relationship quality and the theory of planned behavior models of behavioral intentions and purchase behavior.	<i>Journal of Business Research</i> , Vol. 62, No. 1, pp. 82-92.
Alsajjan B and Dennis C (2010)	Internet banking acceptance model: Cross-market examination.	<i>Journal of Business Research</i> , Vol. 63, Nos. 9-10, pp. 957-963.
Fuller J, Faullant R and Matzler K (2010)	Triggers for virtual customer integration in the development of medical equipment- From a manufacturer and a user's perspective.	<i>Industrial Marketing Management</i> , Vol. 36, No. 8, pp. 1376-1383.
Lee M C (2010)	Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model.	<i>Computers & Education</i> , Vol. 54, No. 2, pp. 506-516.
Schaik, P.V. & Ling, J. (2011).	An integrated model of interaction experience for information retrieval in a Web-based encyclopaedia.	<i>Interacting with Computers</i> , Vol. 23, No. 1, pp. 18-32.
Sari, M. & Rofaida, R. (2011).	Factors affecting the behavior of university community to use credit card.	<i>Journal of Business Research</i> , Vol. 4, No. 3, pp. 217-228.
Chen M F and Lu T Y (2011)	Modeling e-coupon proneness as a mediator in the extended TPB model to predict consumers' usage intentions.	<i>Internet Research</i> , Vol. 21, No. 5, pp. 508-526.
Li Y (2012)	Theories in online information privacy research: A critical review and an integrated framework.	<i>Decision Support Systems</i> , Vol. 54, No. 1, pp. 471-481.
Jalilvand M R and Samiei N (2012)	The impact of electronic word of mouth on a tourism destination choice: Testing the theory of planned behavior (TPB).	<i>Internet Research</i> , Vol. 22, No. 5, pp. 591-612.
Hsu C L, Lin J C C, Chiang H S (2013)	The effects of blogger recommendations on customers' online shopping intentions.	<i>Internet Research</i> , Vol. 23, No. 1, pp. 69-88.
Gabbiadini A, Mari S and Volpato C (2013)	Virtual users support forum: Do community members really want to help you?	<i>Cyberpsychology, Behavior, and Social Networking</i> , Vol. 16, No. 4, pp. 285-292.

Table 3: Summary of Research Hypotheses

Hypothesis	Path
H1: Relationship quality positively affects continuance intention toward using SSTs	RQ → CI
H2: Perceived usefulness positively affects continuance intention toward using SSTs	PU → CI
H3: Perceived ease-of-use positively affects perceived usefulness toward using SSTs	PEOU → PU
H4: Subjective norm positively affects continuance intention toward using SSTs	SN → CI
H5: Perceived behavioral control positively affects continuance intention toward using SSTs	PBC → CI
H6: Perceived usefulness positively affects relationship quality toward using SSTs	PU → RQ
H7: Perceived ease-of-use positively affects relationship quality toward using SSTs	PEOU → RQ
H8: Subjective norm positively affects perceived usefulness toward using SSTs	SN → PU
H9: Perceived ease-of-use positively affects perceived ease-of-use toward using SSTs	PBC → PEOU

Note: RQ= Relationship quality; CI= Continuance intention; SN= Subjective norm; PBC= Perceived behavioral control; PU= Perceived usefulness; PEOU= Perceived ease-of-use.

Table 4: Measurement Items and Relevant Literature

Construct	Measurement Item	Source
Perceived usefulness	Using SSTs would enhance my effectiveness for your work/study/life tasks Using the SSTs would improve your productivity You find the SSTs useful in your daily life	Davis, 1989; Thong, 2006; Liao <i>et al.</i> , 2007; Kim, 2008
Perceived ease-of-use	It is easy for you to use the SSTs Interaction with the SSTs does not require a lot of mental effort Your interaction with the SSTs is clear and understandable	Davis, 1989; Thong, 2006; Liao <i>et al.</i> , 2007; Kim, 2008
Subjective norm	People who influence you would think that you should use SSTs People who are important to you would think that you should use SSTs People whose opinions are valued to you would prefer that you should use SSTs	Taylor & Todd, 1995; Liao <i>et al.</i> , 2007
Perceived behavioral control	You had the resources, knowledge, and ability to use SSTs Using SSTs was entirely within your control You would be able to use SSTs	Taylor & Todd, 1995; Liao <i>et al.</i> , 2007
Satisfaction	Overall, you are satisfied with the SSTs offered by the firm The SSTs offered by the firm exceed your expectations The SSTs offered by the firm are close to your ideal SSTs	Bhattacharjee, 2001; Tam and Wong, 2001; Liao <i>et al.</i> , 2007; Chen, 2012
Trust	Overall, the firm who offer the SSTs is worth trust I believe the SSTs' quality of products or services offered by the firm I believe the firm who offer the SSTs will put the customer benefits on the first	Crosby <i>et al.</i> , 1990; Ganesan, 1994; Garbarino & Johnson, 1999; Huang & Yu, 2006; Chen, 2012
Commitment	I plan to keep in touch with the SSTs offered by the firm It is important to me that maintain the relationship with the SSTs offered by the firm I want to maintain the profitable relationship with the SSTs offered by the firm	Anderson & Weitz, 1992; Morgan & Hunt, 1994; Wilson, 1995; Huang & Yu, 2006
Continuance Intention	Whenever possible, you intend to use SSTs to finish what have to do You intend to continue using SSTs to do what you have to do You intend to continue using SSTs to do what you have to do	Bhattacharjee, 2001; Bhattacharjee & Premkumar, 2004; Bhattacharjee <i>et al.</i> , 2008

Table 5: Factor Loadings and Cross Loadings of Outer Model

	RQ	CI	SAT	TRU	COM	PEOU	PU	SN	PBC
CI1	0.53	0.92	0.57	0.39	0.36	0.53	0.56	0.34	0.54
CI2	0.53	0.93	0.56	0.40	0.37	0.48	0.52	0.34	0.53
CI3	0.59	0.88	0.58	0.46	0.44	0.43	0.45	0.41	0.46
SAT1	0.76	0.61	0.87	0.51	0.48	0.44	0.44	0.35	0.42
SAT2	0.79	0.55	0.90	0.55	0.52	0.39	0.36	0.33	0.41
SAT3	0.68	0.40	0.80	0.44	0.45	0.28	0.25	0.33	0.27
SAT4	0.74	0.59	0.85	0.49	0.50	0.43	0.43	0.33	0.38
TRU1	0.74	0.47	0.53	0.88	0.55	0.36	0.35	0.35	0.34
TRU2	0.67	0.31	0.45	0.82	0.52	0.23	0.28	0.32	0.20
TRU3	0.76	0.39	0.52	0.86	0.64	0.26	0.29	0.29	0.32
COM1	0.80	0.40	0.55	0.64	0.90	0.26	0.25	0.32	0.34
COM2	0.73	0.34	0.46	0.57	0.89	0.20	0.21	0.32	0.23
COM3	0.74	0.39	0.51	0.56	0.87	0.23	0.24	0.29	0.30
PEOU1	0.38	0.46	0.42	0.29	0.23	0.88	0.46	0.21	0.47
PEOU2	0.39	0.48	0.43	0.29	0.25	0.89	0.53	0.22	0.50
PEOU3	0.28	0.38	0.28	0.24	0.18	0.75	0.43	0.17	0.35
PU1	0.32	0.49	0.35	0.28	0.18	0.45	0.80	0.24	0.36
PU2	0.40	0.43	0.38	0.35	0.28	0.45	0.84	0.32	0.34
PU3	0.30	0.46	0.32	0.25	0.18	0.49	0.80	0.28	0.35
SN1	0.36	0.32	0.34	0.30	0.27	0.18	0.28	0.84	0.23
SN2	0.37	0.27	0.30	0.33	0.32	0.18	0.26	0.79	0.20
SN3	0.35	0.38	0.32	0.30	0.28	0.23	0.31	0.84	0.22
PBC1	0.37	0.51	0.37	0.28	0.28	0.51	0.39	0.23	0.89
PBC2	0.39	0.43	0.38	0.29	0.30	0.39	0.29	0.18	0.84
PBC3	0.39	0.53	0.40	0.31	0.28	0.49	0.43	0.27	0.90

Note: RQ= Relationship quality; CI= Continuance intention; SN= Subjective norm; PBC= Perceived behavioral control; PU= Perceived usefulness; PEOU= Perceived ease-of-use; Relationship quality is a second-order construct.

RESEARCH METHODOLOGY

Based on the TAM, TPB, and relevant studies, the hypothetical relationships with all theoretical

constructs are proposed in Table 3, whereas the measurement items are summarized in Table 4.

Construct	Composite Reliability	Cronbach's Alpha	AVE
Relationship Quality	0.92	0.91	0.55
Continuance Intention	0.94	0.90	0.83
Satisfaction	0.92	0.88	0.73
Trust	0.89	0.81	0.73
Commitment	0.92	0.87	0.79
Perceived Ease-of-Use	0.88	0.79	0.70
Perceived Usefulness	0.85	0.75	0.66
Subjective Norm	0.86	0.76	0.68
Perceived Behavioral Control	0.91	0.85	0.77

Hypothesis	Standardized Regression weight	t-value	Result
H1: Relationship quality positively affects continuance intention toward using SSTs	0.33***	8.49	Supported
H2: Perceived usefulness positively affects continuance intention toward using SSTs	0.28***	8.29	Supported
H3: Perceived ease-of-use positively affects perceived usefulness toward using SSTs	0.52***	13.06	Supported
H4: Subjective norm positively affects continuance intention toward using SSTs	0.09*	2.20	Supported
H5: Perceived behavioral control positively affects continuance intention toward using SSTs	0.28***	8.02	Supported
H6: Perceived usefulness positively affects relationship quality toward using SSTs	0.27***	5.89	Supported
H7: Perceived ease-of-use positively affects relationship quality toward using SSTs	0.27***	6.18	Supported
H8: Subjective norm positively affects perceived usefulness toward using SSTs	0.22***	6.42	Supported
H9: Perceived ease-of-use positively affects perceived ease-of-use toward using SSTs	0.53***	16.95	Supported

Note: * p-value<0.05, **p-value<0.01, *** p-value<0.001.

DATA ANALYSIS

Outer Model

This empirical data was examined by Smart partial least squares (PLS), because the PLS approach doesn't need the data to possess the normal distribution and is less demanding in terms of large sample size. SmartPLS was used during the data analysis, which consisted of two stages. In the first stage, we examined construct validity

from the outer model, while the second stage analyzed hypotheses testing by the inner model.

Convergent validity is satisfied if different measurement scales are used to measure the same construct, and the relationships from different scales are strongly relevant. According to the suggestions from Fornell and Larcker (1981), we examined three indices including reliability, factor loadings for each indicator, and

Table 8: Mediation Effect Testing			
Relationship	Path	t-value	Sobel Test
PU → RQ → CI	PU → RQ	5.89	4.84***
	RQ → CI	8.49	
PEOU → RQ → CI	PEOU → RQ	6.18	4.99***
	RQ → CI	8.49	
SN → PU → RQ	SN → PU	6.42	4.34***
	PU → RQ	5.89	
PBC → PEOU → RQ	PBC → PEOU	16.95	5.81***
	PEOU → RQ	6.18	

Note: RQ= Relationship quality; CI= Continuance intention; SN= Subjective norm; PBC= Perceived behavioral control; PU= Perceived usefulness; PEOU= Perceived ease-of-use; * p-value<0.05, **p-value<0.01, *** p-value<0.001.

the value of Average Variance Extracted (AVE). As shown in Table 5, all standardized factor loadings for constructs are large than 0.7. As shown in Table 6, Cronbach’s alpha, composite reliability and AVE are large than 0.7, 0.7, and 0.5, separately.

Discriminant validity can be examined using comparison of standardized factor loadings and cross loadings. As shown in Table 5, we can find that all factor loadings are large than cross loadings. So we can claim this empirical data has discriminant validity. Therefore, the above results demonstrated outer model was acceptable.

Inner Model

Partial least square was used to examine nine research hypotheses proposed in this article. The hypothetical model was illustrated using SmartPLS. As shown in Table 7, all hypotheses are supported at the 95% confidence level.

Mediation Effect Testing

This section is mainly to explain the mediation effects of relationship quality. Besides relationship quality, perceived usefulness and perceived ease-of-use are two mediators in this study. As shown in Table 8, we can find that the mediation effects

of relationship quality, perceived ease-of-use, perceived usefulness existed because the z-value of Sobel test is large than 2.

CONCLUSION

Through the literature review, this research proposed the research framework to integrate the technology acceptance model, theory of planned behavior and relationship quality. Especially, few studies discussed the mediation effects of relationship quality, we proved the importance of relationship quality via empirical data.

Some research limitations should be discussed in the near future. First, cross-sectional approach is applied in this research, and the scholars should reexamine the related hypotheses from the longitudinal viewpoints. Second, we ignored the possibility of common method bias. We hope more scholars and researchers could enhance the relevant research issues and topics.

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Hyderabad, INDIA. Ph: +91-09441351700, 09059645577

E-mail: editorijmrbs@gmail.com or editor@ijmrbs.com

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