Users' Post-Adoption Behaviors of Cloud Storage Services

K. Chaweanghong and S. Panichpathom

***Abstract*—The growth of varied mobile devices, such as smartphone and tablet, and high-speed Internet enhance the ease of transferring huge amount of data. Cloud storage services (CS) is one of popular online services used in contexts of individual and job activities. This study proposes a framework to analyze post-adoption user behavior with CS, in order to enhance cloud service provides to provide better services and finally reduce service development costs. It also analyzes the relationships among Confirmation (CON), Perceived enjoyment (ENJ), perceived relative benefits (PRB), perceived usefulness (PU), user satisfaction (SAT) and usage behavior. Respondents are people who have used or used CS delivered by at least two different providers. Structural Equation Model (SEM) is used to analyze collected data. Results implicate that ENJ and PU have high direct effects on SAT. CON and PRB have almost the same level of direct effect on SAT. Direct effect factors influence SAT higher than indirect effect factors. In term of direct effect, CON has direct effect higher than ENJ. Infusion usage behavior is consisted of (1) Extend use (EXT), (2) Integrative use (INT) and (3) Emergent use (EMR). Results show that all indirect effect factors less influence IS Infusion than direct effect factors. High direct effect factors influence EXT are PU and SAT, respectively. High direct effect factors influence INT are SAT and PU, respectively. Only one direct effect factor influence EMR is PU. These findings demonstrated the understanding about user behavior with CS, and show varied behaviors.**

***Index Terms*—Cloud storage services, post-adoption behaviors, IS-infusion, PLS-SEM, user satisfaction.**

I. Introduction

Current online services have been widely popular due to the growth of the mobile device, such as smart phones and tablets. High-speed Internet connection also enables more easily transferring large data [1].

Cloud storage is another form of online services that are widely used both in personal and in the enterprise context [2]. Cloud storage is a type of Software-as-a-Service (SaaS) offered by system providers to process varied software or computer applications over the Internet. Cloud storage service providers, in general, offer several types of digital storage. For example, in addition to the basic features to store or save data, service providers have other supplement services such as providing cloud storage by Google, called "Google Drive". This cloud storage coupled with "Google Docs" enables multiple users from anywhere on any device to create and edit documents simultaneously. The supplement services improve the efficiency of providers' services, maintain their current market share and might expand their sizes of market shares in the future.

The storage cloud providers, who have the insights about the behavior of users, will be able to develop and deliver services to meet the needs of service users and reduce the development cost by cutting features, which are not in accordance with the requirements of the service users. This research study, thus, aims to analyze the cloud service usage of users, who have used the service for a certain period. The usage behaviors in this study emphasize the Information Systems Infusion of post-adoption, which derived from the satisfaction in delivered services and the perceived usefulness of services. Main research questions are (1) how do perceived usefulness, expectation confirmation, perceived enjoyment and perceived relative benefits impact the satisfaction in cloud services? and (2) how do the satisfaction of the service and the perceived usefulness affect the usage behavior of the cloud storage?

II. Literature Review and Conceptual Framework

A Post-Acceptance Model of IS Continuance proposed by Bhattacherjee [3] is based on Expectation-Confirmation Theory (ECT) proposed by Oliver [4]. This model (Fig. 1) demonstrates that three main factors causing intention to continuously use are Perceived Usefulness (PU), Expectation Confirmation (CON) and Satisfaction in Cloud Service Use (SAT). The result of Bhattacherjee's [3] study also manifests that satisfaction influences online banking usage behavior. Online banking users will not continue to use the services if they are not satisfied with delivered services even though they receive perceived usefulness.

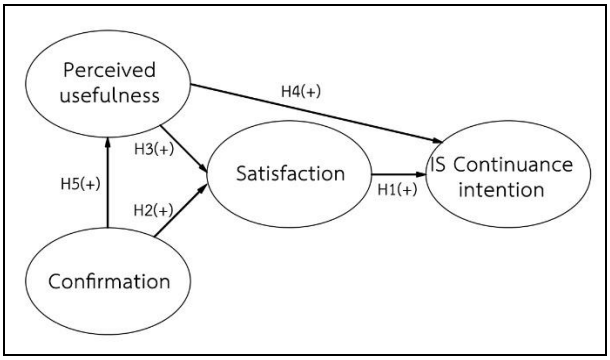

Fig. 1. A post-acceptance model of IS continuance.

Mode of service delivered by cloud storage is similar to that delivered by an online banking service. Online banking is a service offered to individual via applications but cloud storage service offered via banking applications on

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K. Chaweanghong and S. Panichpathom are with Thammasat University, Thailand (email: krittkarin@gmail.com, supeecha@tbs.tu.ac.th).

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cell-phones being installed and implemented on varied types of computer and can be accessed services by using the Internet browser. Since there are several cloud storage providers, increasing the number of users and maintaining the customer base are in great need for online services. Cloud storage service providers, therefore, should have the insights about the factors influence satisfaction in service usage and then influences continued usage.

According to previous studies, this study proposes three hypotheses as follows.

H1: *Expectation confirmation positively influences perceived usefulness.*

H2: *Perceived usefulness positively influences satisfaction in service usage.*

H3: *Expectation confirmation positively influences satisfaction in service usage.*

Expectation confirmation is a comparative degree of accordance between the actual delivered services and the expected services. Previous research studies found that the results from the services were in line with the expected services and further engendered enjoyment of the service [5], [6], [7]. The next hypothesis, thus, is as follows.

H4: *Expectation confirmation positively influences perceived enjoyment.*

According to the study of Kim and Min [8], use experience and enjoyment resulting from the use of information systems stimulate positive attitude toward information services and increase the level of users' satisfaction. Thus, hypothesis 5 is as follows.

H5: *Perceived* enjoyment *positively influences satisfaction in cloud storage service use.*

Nowadays, there are several cloud storage providers who offer similar freemium services, users, thus, are easily select to use the services from any providers. However, users might compare the benefits derived from each provider and choose the one that give them maximum benefits [9], [10]. When users perceive the relative benefit, they will gain higher satisfaction too [8]. The hypothesis 6, therefore, is as follow.

H6: *Perceived* relative *benefit positively influences satisfaction in cloud storage service.*

Post-adoption behavior occurs after users receive the services for their general use, their ad hoc use and their routine use. The uses in infusion stage or the post-adoption behaviors include extended use, integrative use and emergent use [11]. The routine use and the use during infusion stage might enable users to increase the use volume [12]. In other words, after using information systems for a while, users will learn to extend their uses to fit their purpose, which is called extended use. Then they will apply their use to their jobs, which is called integration use. The study of Premkumar and colleagues [11] is later confirmed with the study of Saeed and Abdinnour [13]. In year 2013, they found that perceived usefulness is one of good indicators of extended use. Beginner users of cloud storage services start with using general data storage services, such as storing data file and photo. Sometimes, they might include the use for their jobs or combine their uses with other application software or with other services. The perceived usefulness, thus, should engender using cloud storage in a deep and thorough. The next three hypotheses for this study are as follow.

H7: *Perceived usefulness positively influences the extended use.*

H8: *Perceived* usefulness *positively influences the integrative use.*

H9: *Perceived* usefulness *positively influences the emergent use.*

Satisfaction in cloud storage service use is a positive result from use experiences and this satisfaction will also affect the use of information [4]. Owing to the information systems success model, users with higher level of satisfaction will increase the use of the services. According to the post-acceptance model of information system continuance, the intention to continuously use comes from the received satisfaction [3]. The higher level of satisfaction users has, the more likely they try additional features of the service and also try to initiate innovative use of the services [14]. The next three hypotheses of this study are as follow.

H10: *Satisfaction in cloud storage service positively influences the extended use.*

H11: *Satisfaction in cloud storage service positively influences the integrative use.*

H12: *Satisfaction in cloud storage service positively influences the emergent use.*

In sum, the proposed conceptual framework of this study is shown in Fig. 2.

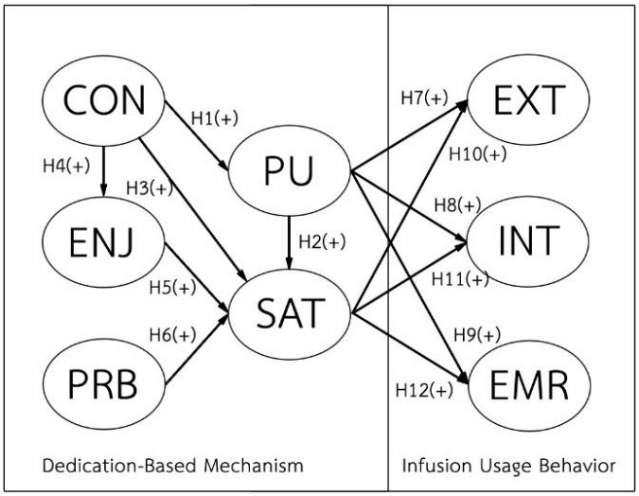

Fig. 2. Proposed conceptual framework.

III. Research Methodology

The sample of this study is people who have experienced in the use of cloud storage services with at least two service providers. The instrument for gathering data is an online questionnaire (Table I) using convenient sampling. The acronym of cloud storage service is CS.

We start with creating and estimating a partial least squares (PLS) path model, then we evaluate the quality of the path model by (1) assessing the measuring model and (2) assessing the structural model. We evaluate the measuring scale with composite reliability, variance extracted, indicator reliability and discriminant validity. We assess the structural model with path coefficient.

TABLE I: MEAN, STANDARD DEVIATION AND LOADINGS VALUE OF ITEMS IN THE QUESTIONNAIRE

	Items	Mean	SD	Loadings
PU	1 I store, access, and share data with reduced time and effort when I use CS	3.979	0.892	0.700
	2 CS enables me to rapidly access my data and jobs from any places with any devices.	4.461	0.722	0.758
	3 I work more conveniently when I use CS.	4.411	0.746	0.773
	4 CS use increases the effectiveness of my jobs, such as finishing or increasing jobs with reduced time or increasing the accuracy of jobs.	3.812	0.924	0.763
	5 when I use CS with my jobs, I increase the efficiency of my jobs.	3.859	0.936	0.706
CON	1 CS experience that I use today meets or is beyond my expected use level.	3.919	0.787	0.830
	2 Level of CS that I currently use is in line with or better than I thought.	3.929	0.743	0.862
	3 I feel that CS that I currently use has higher capability than I thought.	3.843	0.832	0.765
	4 The use of CS is easier than I thought.	4.094	0.784	0.802
	5 CS meets or is beyond my expectation.	3.976	0.777	0.847
ENJ	1 I enjoy sharing files and photos between friends and people I know through CS	3.351	0.991	0.652
	2 I feel that the use of CS is exciting and new experience.	3.361	0.946	0.680
	3 I feel happy when my friends or acquaintances share information with me through CS.	3.510	0.951	0.681
	4 I feel happy when I found the consistent data stored in any of my devices because I do not face difficulty in copying data between devices.	4.160	0.861	0.846
	5 I feel happy because I do not have to worry about data loss when using CS.	4.131	0.894	0.782
PER	1 CS offers that I currently use are better service from other providers because I can access and transmit or forward data to others more easily.	3.832	0.824	0.876
	2 Current CS providers offer more convenient and easier use than other providers do.	3.838	0.853	0.881
	3 Comparing with other providers, CS offers, that I currently use, are more efficient.	3.746	0.816	0.881
	4 Comparing with other providers, CS offers that I currently use are compatible with my other applications.	3.796	0.856	0.842
	5 Overall, the CS offers from current providers is better than services from other providers.	3.804	0.829	0.903
SAT	1 I prefer to use CS.	4.202	0.795	0.890
	2 I think CS use is a good idea.	4.338	0.73	0.881
	3 I think the choice of CS I currently use is a wise one.	4.251	0.748	0.854
	4 CS offers that I currently use deliver me fulfilled services	4.152	0.733	0.848
	5 Overall, I am gratified to use CS.	4.257	0.696	0.889
EXT	1 I use all the functions of the CS to support my applications.	3.495	0.954	0.829
	2 I can use the features of the CS more than other users do.	3.293	0.931	0.801
	3 I use the new functions of CS in personal use or to support my work.	3.534	0.925	0.882
	4 I use the other features of CS rather than general use to support my work.	3.463	0.931	0.870
	5 I always try new features when CS provider has more new features.	3.419	1.004	0.822
INT	1 I can combine CS use with other products such as Microsoft Office.	3.916	0.962	0.788
	2 I can very well use CS in sharing data on social networks.	3.785	0.904	0.760
	3 I can very well use CS together with my jobs.	3.851	0.863	0.847
	4 When I want to attach large files to email. I tend to use CS with email.	4.037	0.94	0.757
	5 I use CS coupled with the camera on cell phone to synchronize photos and short movies and share to other devices or share them on social media.	3.725	1.046	0.676
EMR	1 I always find other ways to use CS to provide support for my use.	3.398	0.981	0.825
	2 I always find new ways to use CS to provide support for my use.	3.026	1.066	0.845
	3 I tend to use CS in this new format to support my applications.	3.338	0.989	0.869
	4 I can use CS in a different way from the others, as not only used for data storage or backup only.	3.160	1.067	0.843
	5 I could use CS for other purposes, such as to locate and remove the virus, to publish personal websites, to develop an application or to work together as a team.	2.809	1.120	0.767

IV. RESULTS

A. Respondent Profile

The valid questionnaire is 382 out of 188. The proportion of male (48.69%) and female (49.74%) respondents are almost the same, however, 1.57% of respondents indicate other gender. Most respondents are in the age range 26-30 years old (46.34%), the highest level of education is bachelor degree (61.78%) and the occupation (57.85%) is working at private sectors.

B. Measuring Model Assessment

According to Bagozzi and Yi [15] in SEM, rather than Cronbach's alpha, we use composite reliability (CR) to test the reliability of measuring scale. The CR for all latent variables or constructs are much greater than 0.7 (Table II), we conclude that our constructs have high levels of internal consistency.

TABLE II: THE RESULTS FROM MEASURING MODEL ASSESSMENT

Construct	CR	AVE	R^2
CON	0.912	0.676	-
EMR	0.917	0.690	0.092
EXT	0.923	0.707	0.247
INT	0.868	0.622	0.362
ENJ	0.815	0.597	0.304
PRB	0.943	0.769	-
PU	0.859	0.549	0.351
SAT	0.941	0.762	0.646

We verify the convergent validity with the average variance extracted (AVE) of each construct. The results (Table II) shows that all AVE coefficients are greater than 0.5 and we conclude that our constructs have convergent reliability.

To determine the discriminant validity, we perform the square root of the AVE ($\sqrt{AVE}$) of each latent variable. Our data shows that the ($\sqrt{AVE}$) is greater than the correlation coefficient between the latent variables [16]. Table III presents the ($\sqrt{AVE}$) coefficients of each construct and the correlations between the latent variables. As the ($\sqrt{AVE}$) of all latent constructs are greater than the correlation coefficients, we conclude that our constructs have discriminant validity.

TABLE III: RESULTS OF DISCRIMINANT VALIDITY TEST

Construct	CON	EMR	EXT	INT	ENJ	PRB	PU	SAT
CON	**0.822**							
EMR	0.279	**0.831**						
EXT	0.464	0.649	**0.841**					
INT	0.565	0.424	0.563	**0.789**				
ENJ	0.551	0.297	0.408	0.531	**0.773**			
PRB	0.591	0.348	0.522	0.553	0.467	**0.877**		
PU	0.593	0.297	0.476	0.511	0.488	0.540	**0.741**	
SAT	0.651	0.244	0.422	0.576	0.671	0.590	0.662	**0.873**

The above content is related to the assessment of measuring model. Next we will assess the structural model and test the hypotheses with the determination coefficients (R^2) and path coefficient.

C. Structural Model Assessment

Table II presents the R^2 of all constructs greater than 0.25, we, therefore, conclude that variable "expectation confirmation" (CON) explains "perceived usefulness" (PU) and "enjoyment" (ENJ) 35.1% of the variance in PU and 30.4% of the variance in ENJ, respectively. The combined variables CON, PU and ENJ explain 64.6% of the variance of the "satisfaction in cloud storage service" (SAT). Concerning the infusion usage behavior, the combined variables PU and SAT explain 24.7 % of the variance of "extended use" (EXT), 36.2% of the variance of "integrative use" (INT) and 6.2% of the variance of "emergent use" (EMR), respectively.

TABLE IV: SIZES AND SIGNIFICANCE OF THE PATH COEFFICIENTS OF THE INNER MODEL

hypotheses		Path Coefficients	T Statistics	Result
H1	CON -> PU	0.593	15.096*	support
H2	PU -> SAT	0.293	6.299*	support
H3	CON -> SAT	0.193	4.482*	support
H4	CON -> ENJ	0.551	12.956*	support
H5	ENJ -> SAT	0.35	8.705*	support
H6	PRB -> SAT	0.154	3.708*	support
H7	PU -> EXT	0.349	5.797*	support
H8	PU -> INT	0.232	3.244*	support
H9	PU -> EMR	0.24	3.509*	support
H10	SAT -> EXT	0.192	3.211*	support
H11	SAT -> INT	0.423	6.248*	support
H12	SAT -> EMR	0.086	1.258	Not support

* $p<0.01$

Table IV demonstrates the sizes and significance of the path coefficients of the inner model. The theoretical relation (path) between all constructs is statistically significant since the standardized path coefficients are greater than 0.1. Hypotheses 1-11 are supported, however, hypothesis 12 is not supported by our data in this study (Table IV). As shown in Fig. 2 and Fig. 3, four constructs, namely, PU, CON, ENJ and PRB influence SAT.

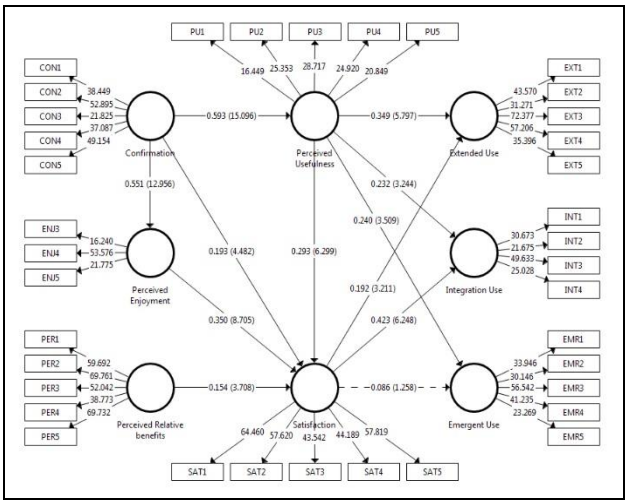

Fig. 3. Hypothesis testing results.

Table V demonstrates direct, indirect and total effects of all constructs. As shown in Table V, we found that the indirect effect from CON to SAT (.367) is a little bit greater than the direct effect from ENJ to SAT (.350).

TABLE V: DIRECT, INDIRECT AND TOTAL EFFECTS OF ALL CONSTRUCTS

Constructs	Direct effect	Indirect effect	Total effect
CON -> EMR		0.190***	0.190***
CON -> EXT		0.314***	0.314***
CON -> INT		0.374***	0.374***
CON -> ENJ	0.551***		0.551***
CON -> PU	0.593***		0.593***
CON -> SAT	0.193***	0.367***	0.560***
ENJ -> EMR		0.030^{ns}	0.030^{ns}
ENJ -> EXT		0.067***	0.067***
ENJ -> INT		0.148***	0.148***
ENJ -> SAT	0.350***		0.350***
PRB -> EMR		0.013^{ns}	0.013^{ns}
PRB -> EXT		0.030**	0.030**
PRB -> INT		0.065***	0.065***
PRB -> SAT	0.154***		0.154***
PU -> EMR	0.240***	0.025^{ns}	0.265***
PU -> EXT	0.349***	0.056***	0.405***
PU -> INT	0.232***	0.124***	0.356***
PU-> SAT	0.293***		0.293***
SAT-> EMR	0.086^{ns}		0.086^{ns}
SAT-> EXT	0.192***		0.192***
SAT-> INT	0.423***		0.423***

*** $p<0.01$, ** $p<0.05$, *ns*=not significant

Concerning the infusion usage behavior, we found that both PU and SAT together directly affected EXT and INT, however, only PU directly affected EMR. In terms of indirect effects, we found that the most important construct, which indirectly affected EXT was CON via PU to EXT. However, the direct effect from PU to EXT is stronger than the indirectly effect from CON via PU to EXT. Similarly, the

most important constructs, which directly affected INT were ENJ via SAT to INT and PU via SAT to INT. Both indirect effects had similar level of influences to INT. However, the direct effect from SAT to INT is stronger than the indirect effects of both cases mentioned above. Finally, in term of EMR, the indirect effect is derived from CON via PU to EMR. The direct effect from PU to EMR is stronger than the indirect effect from CON via PU to EMR.

In sum, with the respect to three aspects of infusion usage behavior (EXT, INT and EMR), the most effect is direct (not indirect) effect from PU to EXT, from SAT to INT and from PU to EMR.

V. Discussion

Our results reveal that almost all hypothesized paths are supported (Table IV). This study also suggests that the higher level of accordance between the actual use of cloud storage service of users and their expected use, the higher perceived usefulness they feel, especially the usefulness in term of job support. This result is in line with the study of Bhattacherjee [3], who studied based on the continued usage intention and also in line with the study of Min and Shenghua [17] and Kim *et al*, [6]. This insight expands the contributions of continued usage intention and post-adoption behavior.

The expectation confirmation enables users perceived that the cloud storage use is useful, enjoyable, and satisfied. This result is in accordance with varied previous studies [5], [7], [8], [9], [18]. For example, the study of Kim and Min [8], stating that enjoyable and satisfied experiences encourage positive attitudes of users and enhance the satisfaction of users too. Since we found out that the indirect effect of expectation-confirmation (CON) to satisfaction (SAT) is almost the same as the direct effect from perceived enjoyment (ENJ) to satisfaction (SAT), the cloud storage service providers can stimulate their customers' satisfaction by implementing expectation-confirmation (CON) via perceived usefulness (PU) and via perceived enjoyment (ENJ) or just by implementing perceived enjoyment (ENJ). In other words, if the marketing positioning of the service providers is both usefulness and enjoyment, they better implement indirect effect from expectation-confirmation (CON). Otherwise, they should concentrate on perceived enjoyment (ENJ) only. Furthermore, these findings suggest service providers to emphasize the development of the features or functions of their services to make users feel happy and/or excited in using their services. They should bear in mind that enjoyment is more important than expectation confirmation, perceived usefulness and perceived relative benefit.

Concerning infusion usage behavior, the users of cloud storage services not only use fundamental features or functions of the cloud storage but also discover new ways to apply the fundamental use in order to increase their use fulfillment. This is the emergent use, which is the use that users never think of it before starting to use it. One of the influential construct in post-adoption of cloud storage is perceived usefulness (PU). This PU influences both extended use and emergent use. These findings are consistent with the previous studies [13], [14].

If cloud storage service providers want to enhance the extended use or the emergent use, they should focus on perceived usefulness (PU). If cloud storage service providers want to enhance the integration use, they should focus on satisfaction (SAT). In sum, theoretically, we realize that the role of satisfaction on infusion use behavior is not as strong as the role of perceived usefulness (PU). Practically, even though this study is based on freemium not premium use, the users still are concerned about usefulness. In the freemium context, therefore, the contribution of this study to the provider is in term of expanding their existing market size rather than their profit.

References

[1] K. Salas. (2015). Dropbox: Does Freemium Work? [Online]. Available: https://openforum.hbs.org/challenge/understand-digital-transformation-of-business/business-model/dropbox-does-freemium-work

[2] Zetta. (2010). Cloud storage adoption trends, barriers and expectations — A survey. [Online]. Available: http://pages.zetta.net/rs/zetta/images/Zetta_Cloud_Storage_Survey.pdf

[3] A. Bhattacherjee, "Understanding information systems continuance: An expectation — Confirmation model," *MIS Quarterly*, pp. 351-370. 2001.

[4] R. L. Oliver, "A cognitive model of the antecedents and consequences of satisfaction decisions," *Journal of Marketing Research*, pp. 460-469, 1980.

[5] I. Lee, B. Choi, J. Kim, and S. J. Hong, "Culture-technology fit: Effects of cultural characteristics on the post-adoption beliefs of mobile Internet users,"in *Proc. International Journal of Electronic Commerce*, pp. 11-51,vol. 11, no. 4, 2007.

[6] B. Kim, M. Kang, and H. Jo, "Determinants of postadoption behaviors of mobile communications applications: A dual-model perspective," *International Journal of Human-Computer Interaction*, vol. 30, no. 7, pp. 547-559, 2014.

[7] C. M. Cheung, X. Zheng, and M. K. Lee, "How the conscious and automatic information processing modes influence consumers, continuance decision in an e-commerce website," *Pacific Asia Journal of the Association for Information Systems*, vol. 7, no. 2, 2015.

[8] B. Kim and J. Min, "The distinct roles of dedication-based and constraint-based mechanisms in social networking sites," *Internet Research*, vol. 25, no. 1, pp. 30-51. 2015.

[9] Y. Lu, Y. Cao, B. Wang, and S. Yang, "A study on factors that affect users' behavioral intention to transfer usage from the offline to the online channel," *Computers in Human Behavior* vol. 21, no. 1, pp. 355-364. 2011.

[10] S. Yang, Y. Lu, S. Gupta, Y. Cao, and R. Zhang, "Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits," *Computers in Human Behavior*, vol. 28, no. 1, pp. 129-142. 2012.

[11] G. Premkumar, K. Ramamurthy, and S. Nilakanta, "Implementation of electronic data interchange: An innovation diffusion perspective," *Journal of Management Information Systems*, pp. 157-186, 1994.

[12] T. H. Kwon and R. W. Zmud, "Unifying the fragmented models of information systems implementation," Paper presented at the Critical issues in information systems research, 1987.

[13] K. A. Saeed and S. Abdinnour, "Understanding postadoption IS usage stages: An empirical assessment of self service information systems," *Information Systems Journal*,vol. 23, no. 3, pp. 219-244, 2013.

[14] W. Wang and P. A. Hsieh, "Beyond routine: Symbolic adoption, extended use, and emergent use of complex information systems in the mandatory organizational context," in *Proc. ICIS* 2006 *Proceedings*, 2006.

[15] R. P. Bagozzi and Y. Yi, "On the evaluation of structural equation models," *Journal of the Academy of Marketing Science*, vol. 40, no. 1, pp. 8-34. 1998.

[16] C. Fornell and D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *Journal of Business Research*, vol. 61, no. 12, pp. 1229-1237, 1981.

[17] Q. Min and X. Shenghua, "An extended expectation confirmation model for information systems continuance," Paper presented at the Wireless Communications, Networking and Mobile Computing, 2007 WiCom 2007.

[18] K. L. Gwebu, J. Wang, and L. Guo, "Continued usage intention of multifunctional friend networking services: A test of a dual-process model using facebook," *Decision Support Systems*, vol. 67, pp. 66-77, 2014.

Kritkarin Chaweanghong is an information technolgy manager at GCapital PCL. He earns his master degree in MIS from Thammasat Uiversity. His skills and abilities are related to software project management, software development planning and estimation, information technology people management

Supeecha Panichpathom is an associate professor at Thammasat Business School, Thammasat University. She has worked as a lecturer for more than 30 years. She got her doctorate degree in MIS from University of Texas at Arlington. Her interested research studies focus on consumer behaviors related to information technology, information systems and real estate business.