TAM and Place: The Role of Convenience in Technology Acceptance

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ABSTRACT

This study investigates the relationship between perceived convenience and the technology acceptance model (TAM). Data were collected from a financial institution in the western United States. The context of the study was the intention of this institution's customers to use an interactive teller machine (ITM). ITMs are automated machines that are replacing tellers in some bank branches allowing customers to engage in transactions such as loan payments, cash deposits and withdrawals, cashing checks, and funds transfers. ITMs differ from automatic teller machines (ATM) in that they allow for assisted interactions by branch and/or remote staff. ATMs are generally not deployed with the expectation of assisted self-service transactions.

Conceptual Framework

The technology acceptance model (TAM) has been used to study how individuals come to accept and use technology. The model was an extension of Fishbein's and Ajzen's (1975) theory of reasoned action (TRA) which posited that intention for a given behavior was a consequence of an individual's attitude and subjective norms. Davis (1989) decomposed the attitude construct into perceived ease of use and perceived usefulness. Since Davis, the model has been used in a myriad of contexts: for example, online shopping (Ashraf, Thongpapanl, & Auh, 2014; Panchamia & Doctor, 2015; Lu & Rastrick, 2014), self-service banking (Kansal, 2016), adoption of app-based cab services (Roy, 2016), online education (Landry, griffeth, & Hartman, 2006; Cheng , 2011), medical technology (Seeman & Gibson, 2009), and customer management (Šebjan, Bobek, & Tominc, 2017). Various models have been proposed to extend the TAM with additional variables: for example, self-efficacy (Joo, Park, & Lim, 2018), motivational variables (Siegel, Acharya, & Sivo, 2017), variables from the diffusion of innovation theory (Lee, Hsieh, & Hsu, 2011). All of these examples apply the TAM in contexts where the technology is readily available to the participants in the study. Convenience and access to the technology were assumed and not studied, as is the case in much of the TAM literature. When convenience has been addressed, it has frequently been from an ease-of-use perspective (e.g., Okazaki &Mendez, 2013; Ozturk, et al., 2015, Yoon & Kim, 2007).

The convenience literature has attempted to address the construct of convenience to make it more formative than reflective (e.g. Brown, 1999; Berry, Seiders,& Grewal, 2002). The literature has demonstrated that the construct of convenience has multiple dimensions (Ozturk et al., 2016). When convenience is studied, frequently one or more dimensions are used that are found in the works of either Brown (1990) or Berry, Seiders, and Grewal (2002). Those dimensions are time, place, acquisition, use, and execution. This paper will investigate the place dimension of convenience and its relationship with the TAM.

Research Model

The subjective norms construct within the TRA and TAM was retained in another extension of TRA, the theory of planned behavior (TPB). Hagger and Chatsizarantis (2005) decomposed subjective norms in a test of the TPB into descriptive norms and injunctive norms. Descriptive norms are those behaviors in which a subject's significant others engage. Injunctive norms are those behaviors a subject's significant others approve of but may not actually engage in the behavior. This study uses the Hagger's and Chatzisarantis' decomposition for subjective norms. The model is in Figure 1.

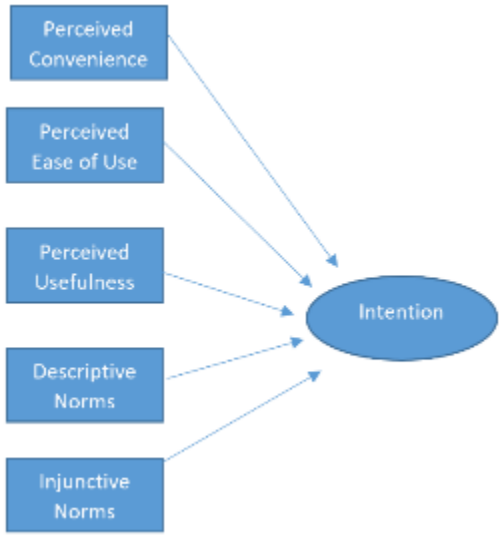

Figure 1: Expanded TAM model.

This paper examines the relationship between the dependent variable of intention and the independent variables of perceived convenience, perceived ease of use, perceived usefulness, descriptive norms, and injunctive norms.

Research Method

An original survey instrument was developed based on Vankatesh and Davis (2000); Ashraf, Narongsak, and Seigyoung (2014); Seeman and Gibson (2009) and Hagger and Chatzisarantis (2005). A pilot test was conducted to validate the research instrument. The pilot and full study collected data from customers within a three-mile radius of one of the financial institution's branches utilizing ITMs. The qualified participants were randomly selected.

Instrument Development and Pilot Test

Field Test

The research instrument was reviewed by management within the institution to ensure that the survey was appropirate for the customer base. The literature on TAM was consulted to ensure variables for the model were addressed. An outside consultancy reviewed the survey to address general survey protocols and language usage within the survey.

One measure was used to capture perceived convenience (PC). Three measures were used to address perceieved ease of use (PEOU). Four measures were used to capture perceived usefulness (PU). Five measures were used to capture subjective norms (SN): two for injunctive norms, three for descriptive norms.

Pilot Test

The field-tested instrument was sent to 400 randomly selected customers. There were 63 responses received. The sample size for the pilot study was sufficient: It was larger than 10% of the received responses of the larger study and was sufficient for determining reliability (Connelly, 2008; Hertzog, 2008). It was twice as large as the sample size recommended by Hill (1998).

To validate the instrument, principle components analysis (PCA) was run on the data (Varimax rotation). The results are reported in Figure 2. The single measure of PC loaded at .87. The three variables for PEOU loaded at .68 or above. All of the variables for PU loaded at or above .69. Three of the subjective norms variables loaded above .6 and two did not. The variables loading sufficiently were the measures related to descriptive norms, what significant others actually do. The SN measures that failed to load were the measures for injunctive norms, what significant others think about ITMs/banking technology. Overall reliability of the instrument was supported (α = .90).

	1	2	3	4
PC1	-.030	-.069	.224	.866
PEOU2	.585	.139	.677	-.033
PEOU3	.101	.187	.827	.238
PEOU4	.495	.042	.680	.044

PU5	.690	.169	.229	-.023
PU6	.849	.217	.272	-.018
PU7	.885	.207	.183	.066
PU8	.842	.223	.218	.212
SN9	.043	862	.249	-.149
SN10	.323	.840	.125	.015
SN11	.428	.646	-.039	.488
SN12	.559	.484	.055	.469
SN13	.497	.501	0.38	-.347

Figure 2: PCA results with Varimax rotation.

The non-loanding variables were removed: The model is presented in Figure 3.

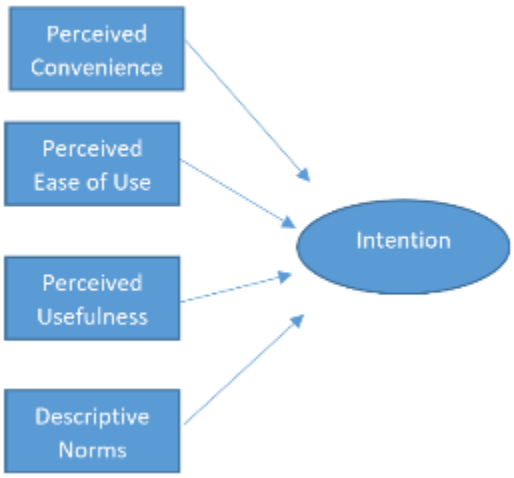

Figure 3: Revised model based on PCA results.

Hypotheses

Based on the research of Vankatesh and Davis (2000); Ashraf, Narongsak, and Seigyoung (2014); Seeman and Gibson (2009); Hagger and Chatzisarantis (2005); and Brown (1990), the hypotheses presented in Figure 4 were developed and will be tested.

H1	A significant relationship exists between PC and Intention
H2	A significant relationship exists between PEOU and Intention
H3	A significant relationship exists between PU and Intention
H4	A significant relationship exists between DN and Intention

Figure 3: Hypotheses tested in model.

Full Study

Data Collection

A third party was used to distribute electronic surveys and collect responses. 7,122 randomly selected customers were sent the instrument. Responses were collected over a two week period in June 2018. After a two week fielding, 361 responses were received for a response rate of 5.1%.

Method

Multiple linear regression was used to investigate the relationships between the predictors and the outcome variable. Based on previous research, the variables were entered into the model with PU entered first, PEOU entered second, and SN entered third (Bashir & Madhavaiah, 2014; Roy, 2017; Thakur, 2013). PC was entered into the model last.

Results

A total of 29 cases were removed from the analysis because of being overly influential (e.g., Mahalanobis distances, covariance ratios). All variables were found to have a significant relationship with intention; therefore, all hypotheses were supported. See Figure 5. The varaiables accounted for 68% of the variance in intention to use an ITM.

Model		Standardized Coefficients Beta	t	Sig.
1	(Constant)		-2.198	.029
	PU	.453	9.028	.000
	PEOU	.275	5.324	.000
	SN	.174	4.898	.000
	PC	.083	2.262	.024

Figure 4: Significance levels of variables in model.

Follow Up Tests

Because a sufficient number of respondents replied, the data were reviewed in terms of those having used an ITM (n = 190) and those who had not (n = 142).

ITM Users

All variables had a significant relationshp with intention to use an ITM. (Table 1). The strongest influence on intention to use an ITM was PU, which was 1.8 times as strong as PEOU, and more than 2 times as strong as SN or PC based on standardized coefficients (Table 2).

Model	R	R Square	Adjusted R Square	Change Statistics	
				R Square Change	Sig. F Change
1	.763[b]	.582	.580	.582	.000
2	.797[c]	.636	.631	.053	.000
3	.810[d]	.656	.650	.020	.002
4	.819[e]	.670	.662	.014	.008

Table 1. Model Summary for ITM Users

Model		Unstandardized Coefficients		Standardized Coefficients		95.0% Confidence Interval for B	
		B	Std. Error	Beta	Sig.	Lower Bound	Upper Bound
4	Constant	-.058	.366		.874	-.782	.665
	PU	.433	.077	.412	.000	.282	.584
	PEOU	.299	.102	.234	.004	.098	.500
	SN	.146	.050	.152	.004	.048	.245

Table 2. Coefficients of ITM Users

Non-ITM Users

All variables had a significant relationshp with intention to use an ITM except for PC (see Table 3).

The strongest influence on intention to use an ITM was PU, which was 1.8 times as strong as PEOU, and 2.3 times as strong as SN based on standardized coefficients (Table 4). PC did not have a significant relationship with intention.

Model	R	R Square	Adjusted R Square	Change Statistics	
				R Square Change	Sig. F Change
1	.767[b]	.588	.585	.588	.000
2	.802[c]	.643	.637	.055	.000
3	.816[d]	.666	.658	.023	.004
4	.819[e]	.671	.660	.005	.180

Table 3. Model Summary for Non-ITM Users

Model		Unstandardized Coefficients		Standardized Coefficients	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta		Lower Bound	Upper Bound
4		-.739	.417		.079	-1.565	.086
	PU	.524	.096	.442	.000	.333	.714
	PEOU	.335	.121	.245	.006	.096	.574
	SN	.211	.070	.194	.003	.072	.349
	PACCESS	.082	.061	.083	.180	-.038	.203

Table 4. Coefficients for Non-ITM Users

Research Implications

The standardized coefficients suggest that role of PC is not substantial although it is significant. When studies involve technology linked to a particular geographic location, the role of PC is relevant for the TAM model. Further study is warranted to determine whether the effect size of PC will be substantially different in other contexts when studied in the TAM.

Managerial Implications

The contributions of PU and PEOU to the variance in intention suggest that marketers should emphasize the utility and ease of using technologies that are fixed geographically. Descriptive norms play a larger role as well. The higher contribution of PC for customers that have actually used an ITM suggests that convenience to the technology does matter in the customers' reflection about the experience. The insignificance of PC in explaining intention for customers that have not used the techonolgy suggests that convenience is not a consideration until an individual has actually used the technology.

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Paul Leavell is the Chief Strategy and Marketing Officer for Nusenda Credit Union. His research interests include corporate strategy, market segmentation, and the theory of planned behavior.

Relevance to Educators, Researchers and Practitioners

This study demonstrates that convenience (place) has a role in studies involving the technology acceptance model. The role played by convenience in the model may vary based on the familiarity of the consumer with the technology's geographic location. Such a variance should inform the practitioner's marketing strategy related to the technology.

Track: Analytics

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