

A Review on the Relationship Between New Variables and Classical TAM Structure

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Abstract. Integration of different theories and expansion of research areas are the main trends in the research domain of IS adoption. Classical TAM structure has been largely expended by newly added variables. Prior studies [1] have analyzed relationships among variables in TAM and found the stability of classical structure, but what about relationships between new variables and classical structure? We selected 30 articles from the main international journals for analyses. It is found that, SE, SN and PBC are used mostly in extended TAM. The relations between SE, PBC and TAM are consistently significant, but the integration of SN into TAM is not so ideal. In our review scale, this relation is inconsistent. Other variables and relations are also discussed in this article. The conclusions of this article will provide guidance for future researches about extended TAM model building.

Keywords: TAM, TAM classical structure, New variables, Variable relations

1. INTRODUCTION

Although Information System (IS) has played an important role in modern enterprises, the implementation of IS is costly and has a relatively low success rate. Since the middle of 1980s, researchers have begun to concentrate on predicting the effect of IS implementations by exploring user's adoption mechanism for IS. Among these researches, TAM (Technology Acceptance Model) is one of the most important models, which was proposed in the doctoral thesis of Davis (1986). With the development of nearly 20 years, TAM has become to be the mainstream model to explain the mechanism of IS adoption.

Based on different theories, many researchers have added some new variables into the classical TAM structure. For example, based on TPB (Theory of Behavior), Patrick Y.K. et al. added SN (Subject Norm) and PBC (Perceived Behavior Control) into TAM [2], S.-S. Liaw added PE (Perceived Enjoyment) by introducing SCT (Social Cognitive Theory) into TAM [3], and Chorng-Shyong Ong & Jung-Yu Lai added CSE (Computer Self-Efficacy) depending on studies of Attribution Theory and Social Cognitive Theory [4].

Introduction of new variables into classical TAM has enhanced the explanatory power. However, the relations between new variables and classical TAM variables are inconsistent [5] and lack of relevant studies. In this article, we attempt to analyze

these relations by reviewing previous studies and try to provide a reference for future research in IS adoption domain.

2. CLASSICAL TAM STRUCTURE AND VARIABLES

TAM was proposed by Davis in 1989 [6], two main variables are mentioned in the classical TAM (Figure 1): Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). External variables have effects on Attitude toward Using (AT) and Behavior Intention (BI) through PEOU and PU, and finally affect the Use (U) of IS.

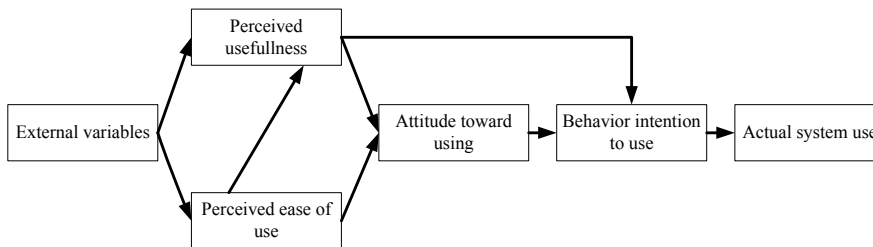


Figure 1. Classical Structure of TAM [6]

Different researchers in different researches used different TAM structures. They get extended models by adding some new variables or relations into classical TAM. However, we find most extended TAM models are still built on the classical TAM structure that is made by PU, PEOU, AT, BI and USE [1].

3. NEW VARIABLES IN EXTENDED TAM

In this research, the term ‘new variables’ is defined as the variables that do not exist in classical TAM structure but have initial theory supports, such as SN (based on SCT&TRA), PBC (based on TPB). In our research, we only choose the new variables that be used widely and have theoretical supports. Depending on this criterion, we select Self-efficacy, SN (Subject Norm), Enjoyment, PBC (Perceived Behavior Control), Anxiety, Credibility, Compatibility, Innovation, Cost, Trust and Image which are described in the table below.

Table 1. Explanation of New Variables

	Explanation	Theory
Self-efficacy	People are more likely to make internal attributions when the event outcome is positive [7].	Attribution Theory
	Self-Efficacy is composed by level of ability, intensity of beliefs and generalizability of ability.[8]	SCT [8]
	individual perceived ability to use computer.[10]	CSE [10]
SN	Observed behaviors of others influence the observer to emulate those behaviors.[8]	SCT [8]
	Beliefs that specific individuals or groups approve or disapprove of performing the behavior.[11]	TRA [9] TPB [11]
Enjoyment	The extent to which the activity of using the technology is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated[12]	MM. [12]
PBC	Presence or absence of requisite resources and opportunities [11]	TPB [11]
Anxiety	Computer anxiety was studied by Henderson et al. as an element of the computer attitude scale (CAS) developed by Loyd and Gressard [13].	CAS[13]
Credibility	Credibility can be simply defined as believability.[4]	
Compatibility	Compatibility refers to the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters.[14]	DOI [14]
Innovation	Describes the extent to which the individual has an innate propensity toward adopting a new IT [15].	PIIT [15]
Trust	Trust is basically seen as a common mechanism for reducing social complexity and perceived risk of transaction[16]	Social Exchange [16, 17]
Image	TAM2 theorized that subjective norm achieved its effect on perceived usefulness partially by altering image.[18]	TAM2 [18]

In our research, we care about there types of relations between new variables and classical TAM structure, which are positive significant effect (marked as POS.), negative significant effect (marked as NEG.) and none significant effect (marked as NS.).

4. RESEARCH METHODOLOGIES

The literatures we select come from the journals as follows:

- MIS Quarterly;
- Decision Sciences;
- Management Science;
- Journal of Management Information Systems;
- Information Systems Research;
- Information & Management;
- Journal of Information Technology;
- International Negotiation;
- Academy of Management Journal;
- Computer Standards & Interfaces;
- Government Information Quarterly;

- Human-Computer Studies;
- Decision Support Systems

The selected literatures were published from 1980s to 2006, and most articles are about model applications. These applications are not rigidly adhered to the fruits of predecessors, but creating many new improved models by combining other related theories. In summary, we get 108 articles. And further more, we choose 30 articles for analyzing based on the following three criteria: firstly, TAM is used in an empirical study; secondly, some new variables were added in the research model; finally, the research methodology is well described and the research results are available and complete.

5. FINDINGS OF RESEARCH

Through analyzing of literatures been selected, we get the results bellow:

Table 2. Relations between New Variables and Classical TAM

New variables		PU	PEOU	AT	BI	USE
SE	N.S.					1
	NEG.					
	POS.	4	10		4	1
SN	N.S.			2	4	
	NEG.	2				
	POS.	1			9	1
PE	N.S.		1	1	2	
	NEG.					
	POS.	1	3	4	3	1
PBC	N.S.				1	1
	POS.		4		5	1
Anxiety	N.S.					1
	NEG.	2	5			
Credibility	POS.	2		1	2	
Compatibility	N.S.	1				
	NEG.	1				
	POS.	2	4		1	
Innovation	N.S.					
	POS.	1	2	2		
Cost	NEG.			1	2	
Trust	POS.			1	1	
Image	POS.	1		1	1	

Notes: figures in the table above are the frequency this relation appears in our selected articles.

In order to describe the relations in the table above more clearly and easily understood, we design a structure below. In the center of this structure, that is classical TAM structure and around it that is 8 new variables. Cost, Trust and Image are not included in this structure, because these variables in our literature review are used seldom (less than 4 times).

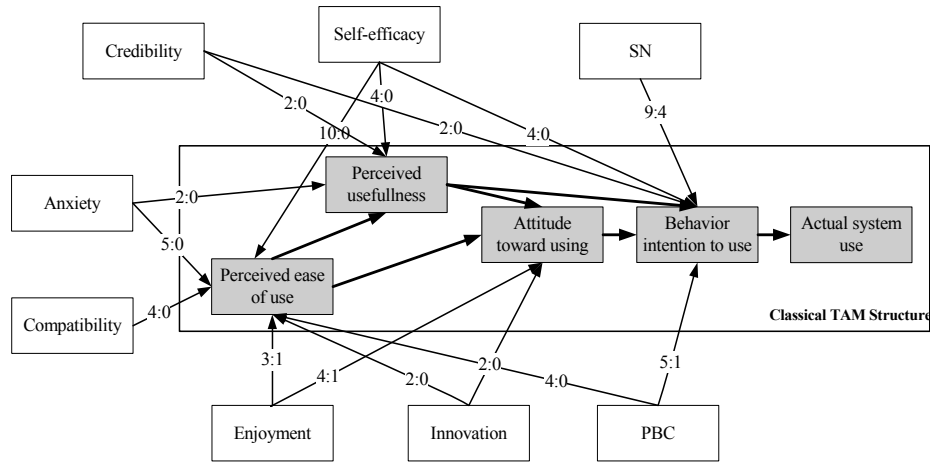


Figure 2. Relations between New Variables and Classical TAM

Notes: the left figure in the relation arrow means the number of significant relations; the right figure means the number of insignificant relations.

There exist consistent positive significant relations between Self-Efficacy and PU, PEOU and BI, no NEG. or N.S. effects were found. SN has 9 POS. relations with BI, but we also find 4 NEG. relations, so this relation is inconsistent, the SN-PU relation is all significant but lack of evidence to decide its effect type (POS. or NEG.). Relations between Enjoyment and PEOU and AT are consistent positive significant (POS.: N.S. is 3:1 and 4:1), but Enjoyment-BI relation is inconsistent (POS.:N.S. is 3:2). PBC has positive significant relation with PEOU and BI (POS.:N.S. is 4:0 and 5:1). Anxiety has significant negative relations with PU and PEOU (NEG.: N.S. is 2:0 and 5:0). Credibility has significant positive relations with PU and BI (POS.:N.S. is 2:0 and 2:0). Relation between Compatibility and PEOU is significant positive (POS.:N.S. is 4:0), but Compatibility-PU is inconsistent (POS.:NEG.: N.S. is 2:1:1). Relations between Credibility, Innovation, Cost, Trust, Image and classical TAM are so fewer in our literature review scale that can not describe their relation types. So in this study these relations are not mentioned.

6. DISCUSSIONS AND CONCLUSIONS

The relations between SE and PU, PEOU and BI are all positive significant in our results. Self-Efficacy refers to an individual’s judgment of his or her ability to use a computer [10]. This may influence an individual’s PEOU and acceptance. Such effects can also get theoretical support from the Self-Efficacy Theory. However, SE and PU relationship has been studied less in contrast to SE-PEOU and SE-BI, but in some special areas such as e-shopping [4], on-line tax [19] and broadband Internet

[20], this relation has been mentioned in relevant hypothesis and empirical evidence shows a positive significant relation-ship between them.

SN-BI relation is inconsistent; the same results can also be got from previous studies. Jiayin Qi & Yuanquan Li found SN-BI relation is 3 significant but 4 insignificant [1]. Although SN is an important variable in TRA and TPB, empirical evidence supporting its roles has been mixed [21, 22]. So we think SN-BI is an important relation in TAM research but more deeply and widely studies should be done.

Prior IS research suggested that PBC might be a determinant of PEOU [23]. In our re-search, PBC - PEOU is consistent positive significant which validates the hypothesis above. PBC – BI is an important relation in TPB [11], an indirect effect through BI is based on the notion that PBC will have a motivating influence based on an individual’s assessment of likelihood of success. Though our research, this effect is supported.

Perceived Enjoyment is an important intrinsic motivation variable which is seen as a determinant of system-specific perceived ease of use [24]. Our result shows that, Enjoyment actually has significant effect on PEOU (3:1). But prior researches believed Enjoyment -PEOU relation changes over time. With increasing experience, PEOU is expected to reflect the unique attributes of enjoyment as it relates to the user-system interaction [24]. We also find Enjoyment has positive significant effect on AT (4: 0), lots of previous researches support this relation, Heijden added PU and verified that it positively affected AT and BI towards personal website adoption [25]. Moon & Kim’s study showed that intrinsic motivation was positively related to attitude towards using the Web [26].

Some researchers believe there are no relationships between computer anxiety and computer-based performance [27, 28, 29, 30]. But others found consistent relations between them. In our research, Anxiety has consistent significant negative effect on PU and PEOU. This consistent relationship is partly due to its independence of prior experience and gender [31], Self Efficacy Theory also conceives Experience and Anxiety as independent factors. So we think that Anxiety has significant negative effect on USE through PU and PEOU.

Agarwal & Prasad asserted a positive relationship between an individual’s prior compatible experiences and the new information technology acceptance [32]. They found that PU and PEOU non-trivially contributed in mediating the effects of compatibility to attitude. However, we only found positive relation between Compatibility and PEOU, Compatibility-PU relationship is inconsistent.

In some special areas like Internet tax-filing [33] and mobile banking [34], PC (Perceived Credibility) is one of the most important factors affecting the use intention, so in this kind of area, relations of PC – BI and PC – PU is concerned a lot [33, 19, 35], and we find both of the relations are positive significant.

7. FUTURE RESEARCHES

In the previous study, relationships among TAM structure were analyzed [1], this article follows that study and further researches the relationships between new

variables and classical TAM structure. In future, more intentions will be paid on the effects of control variables in extended TAM. These three researches will exhibit a panoramic view of the TAM research domain and provide theoretical and practical support for further studies.

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H.P. Shih [46]					+					
M. Pagani [47]				+		+			+	
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S.Y Hung and C.M. Chang [49]	+		+	+	+	+				
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Notes: The mark “+” means relevant new variable used in this article