

Citizens' Adoption of E-government based on TAM Model and Trust-related Factors in China

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Abstract—Based on the TAM model and trust factors to adopt e-government, the article integrates these two perspectives and builds a model of trust in e-government. Then 19 specific observed variables are chosen to make a quantitative analysis of the linkages between trust and behavior intention of citizens. The results shows that citizen's trust is as important to e-government as widely accepted TAM use-antecedents, perceived usefulness and perceived ease-of-use. Together these variable sets explain a crucial impact on citizens' adoption of e-government. The study also provides evidence that e-government trust is built through government trust, institution-based trust and perceived usefulness of e-government.

Index Terms—E-government; TAM model; Trust building process

I. INTRODUCTION

Electronic government increases the convenience and accessibility for citizens to access government information and services. With the implementation of e-government project in China, the government website penetration rate has greatly improved. Up to the end of 2015, the number of domain names ending in gov.cn is 67923, 100% of the central ministries and provincial governments, 99.1% of municipal governments, and more than 85% of the county government had built their own official websites, which leads to the surge in the number of e-government information resources in China. Meanwhile, according to the latest survey from China Internet Network Information Center (CNNIC), till late December, 2016, the total amount of Chinese Internet users reached 731 million, among them, mobile phone users reached 695 million, accounting for 95.1%. E-government system has gradually become the "first platform" for government information disclosure and public service. In spite of abundant e-government information resources, the public access to some government websites is very low, especially the county-level government websites, the average daily access rate only reaches to single digits. It can be seen that citizens' adoption has become one of the main obstacles to the development of e-government in China.

Codagnone & Wimmer noted that lack of trust is an important reason for influencing public use of

e-government. Welch & Hinnant argued that citizens' trust in government a key determinant for citizens' adoption of e-government. Wang & Lu believed citizens' initial trust in e-government is associated with citizens' trust in the Internet government. Another researchers discussed the theme from the technical perspective and investigated the effect of website quality on citizens' adoption of e-government. Precious researches have proved both citizens' assessments of government websites and citizens' trust in government are closely associated with citizens' intentions to adopt e-government, while the impacts of these two perspectives have been examined separately by researchers.

So, combining these two perspectives, this study builds a model of citizens' trust in e-government based on technology acceptance model(TAM) and trust theory and investigates the linkages between trust-related factors and behavior intention of citizens' adoption of e-government. The empirical study findings will help the Chinese government departments find ways to improve citizens' trust in e-government and promote the adoption of e-government under the existing social trust level.

II. THEORETICAL BASIS

A. Trust and the adoption of e-government

Trust is an emotion of mankind and a form of human action, which is widely used in psychology, sociology and economics. As a complicated and abstract concept, trust has different definitions in different cultural backgrounds and disciplines.

By summing up precious research results, Mayer pointed out that trust is a willingness to bear the risk, that is, "the willingness of a party will be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, 1995). As one of the most cited and most believed concepts, Mayer's theory has become the basic concepts for trust researches. Our study adopted his definition for trust. In studying the relationship between trust and user's adoption of e-commerce, Kim and Prabhakar believed users' trust in electronic channels is positively related to their willingness of adoption (Kim and

Prabhakar,2004).Likewise, in studying e-government adoption, Colesca and Dobrica extended this conclusion and they argued that citizens' trust of e-government will directly affect their intention to use it (Colesca and Dobrica,2008). Besides, by investigating, Thompson concluded that citizens' trust in internet technology and government is a a determinant of their behavioral intention to adopt e-government and share their personal information (Thompson,2008). On the above theory results, we can conclude that if government wins citizens' trust, the public will be willing to adopt e-government and thus lead to corresponding behaviors.

B.Technology acceptance model and adoption of e-government information

Technology acceptance model (TAM) is developed on the basis of reasoned action theory (Fishbein and I. Ajzen, 1975) and planned behavior theory(Ajzen, 1991). The former theory believes that people will regulate their attitudes rationally, and subjective standards will further affect their behavioral disposition. Thus this theory is properly used to explain users' adoption of technology. The latter theory expands rational behavior theory and thinks that the main factors determining the disposition of behavior include attitude, subjective standard and perceptual behavior control.These two theories all agree that behavior disposition is highly related with realistic action.In addition, Zumud belived that individual differences have a significant impact on the implementation of a new information technology (Zmud, 1979).Therefore, it is necessary to consider external factors' influence on users' beliefs, attitudes and intentions, and to find how these factors will further affect user's adoption of information technology. On such results, Davis divided various external variables into two parts, i.e. perceived ease of use (PEOU) and perceived usefulness(PU), and did research on their influence on users' adoption of information technology (IT) and came up with technology acceptance model(TAM)(Davis, 1989). PU is a measure of the individual' s subjective assessment of the utility offered by the new IT in a specific task-related context. PEOU is an indicator of the cognitive effort needed to learn and to utilize the new IT. In e-government environment, PEOU refers to e-government will make citizen access government information and corresponding services at a lower cost and through a simpler and more convenient procedures than traditional ways. PU means to citizen will get abundant, authentic, accurate and effective information and corresponding services through e-government. Until now, a numerous empirical tests have shown that TAM is a parsimonious and robust model of technology acceptance behaviors in a wide variety of IT and PEOU and PU will positively affected users' adoption of technology. Thus we proposed PU and PEOU will positively affect citizens' trust in e-government and thus lead to their adoptions of e-government.

C.Government trust and adoption of e-government

Trust in government means citizens' trust in a government's capability to fulfill the services it promised. Genfen claimed that trust in the service providers exerts a significant impact on citizens' adoption of a new technology (Genfen,2003). Government is the provider of government information and corresponding services, so citizens' trust in government will have an obvious influence on their adoption of e-government. Tan ect. argued that citizens' trust in government involves both government ability to provide e-government service and its integrity.(Tan,Benbasat and Cenfetelli,2008). As for government ability, only by having sufficient human resources as well as technology to ensure its stability and security, e-government will possess citizens' trust. As for government integrity, government needs to open its information timely and frankly, which will improve citizens' trust in e-government. On the other hand, governments' timely, open and honest updates on government information will increase citizens' trust in e-government. On the other hand, the delay, concealing and refusal to make it public in excuse of secrecy or privacy will decrease citizens' trust in e-government.

H6: Trust in government is positively correlated with citizen trust in e-government.

When developing the trust in e-commerce, consumers' trust in products' and services' providers will greatly affect their PU and PEOU Similarly, citizens' trust in government will also exert important influence on their PU and PEOU of e-government . There we came with:

H7: Trust in government is positively correlated with citizens' perceived usefulness of e-government services.

H8: Trust in government is positively correlated with citizens' perceived ease of use of e-government services.

D.Institution-based trust and adoption of e-government

Institution-based Trust is formed upon certain legal system and social system. This refers to one's sense of security from guarantees, safety, or other impersonal structures inherent in a specific context (Shapiro,1987; Zucker,1986). McKnight proposed two types of institution-based trust: situational normality and structural assurances (McKnight,1998). Situational Normality is an assessment that the transaction will be a success, based on how normal or customary the situation appears to be (Baier,1986). In the e-government context, if users are required to access e-government through additional and unfamiliar programs,they tend to decrease their level of trust in e-government. Structural assurances or structural safeguards refer to an assessment of success due to safety nets such as legal recourse, guarantees, and regulations that exist in a specific context (McKnight and Chervany,2001). In the context of e-government, Structural assurances can be explained as related legal regulations protecting citizens' rights to have access to e-government with a reasonable

cost and deem it to be true and effective. There we came with:

H9: Intuition-based Trust is positively correlated with citizens' trust in e-government.

H10: Intuition-based Trust is positively correlated with citizens' Perceived Usefulness of e-government.

Previous studies have found that perceptions of institution-based trust exerted strong direct effects on perceived ease of use. As in the case of e-commerce transactions, if the sellers design the purchasing rules in accordance with customers' previous buying habits, they will meet customers' familiar buying patterns and will get customers' trust and customers' perceived ease of use of an e-commerce system will increase as well. Likewise, citizens' perceived ease of use of e-government will increase if the information provided at the government websites is provided through a familiar, user-friendly program that matches citizens' expectations.

H11: Intuition-based Trust will affect citizens' Perceived ease of use of e-government.

E.Disposition to trust and adoption of e-government

Since there is individual difference, trust is also related to the physiological factors of trustors which is called disposition to trust. Disposition to trust reflects individual's tendency to believe or not to believe in others and so trust them. This trend will not be changed by outside environment and trustees. Disposition to Trust can be measured by two dimensions: Faith in humanity, which is one's assumption that others are usually honest and reliable;

and trusting stance, which is one's belief that the relationship with whoever is always in good intention, reliable and will exert expected results (McKnight and Chervany,2001). In such sense, we can tell that trust is the consequence of individual physiological characters that go beyond the government control. Individual's disposition to trust will affect his/her trust in government and regulations. There we came with:

H12: Disposition to trust is positively correlated with citizen trust in government.

H13: Disposition to trust is positively correlated with citizen trust in regulations.

Besides, McKnight & Chervany also pointed out that disposition to trust has important influence on initial stage trust relationships. For China, e-government is still at an early stage when citizens just started getting access to government information and services through e-government websites, disposition to trust will have influence on citizens' trust in e-government. There we came with:

H14: Disposition to trust is positively correlated with citizen trust in e-government.

Based on the theories above, the article came up with a trust factors model for citizens' adoption for e-government, integrating the constructs from TAM(Fig. 1). Trust in e-government has a positive influence on citizens' adoption of e-government, and trust in e-government can be related to five factors: PU, PEOU, government trust, institution-based trust and disposition to trust.

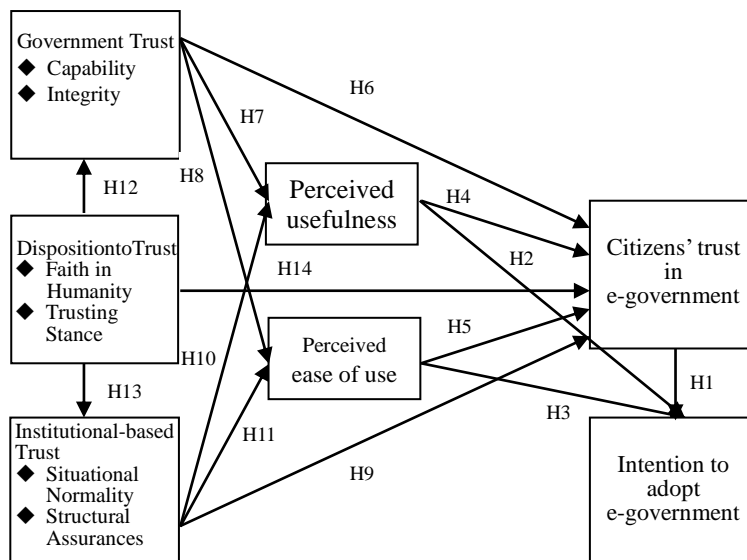


Figure 1. The proposed model of trust in E-government

A. Factor conditions

A questionnaire survey was conducted to examine the proposed model. There are two parts in the questionnaire:

III. INFLUENTIAL FACTORS ANALYSIS OF PSI VALUE-ADDED EXPLOITATION INDUSTRY

One is for demographic questions collecting information about the respondents' gender, age and education background, etc. The other part is about the questions that measure all variables.

After consulting e-commerce and e-government specialists, we modified a few scale items and the final

scale items were summarized in Table 1. Besides, to ensure the data accuracy and convenience to analyze relationship within the variables, we took Likert7 point scale, following a format of strongly disagree, disagree, somewhat disagree, neither agree nor disagree, somewhat agree, agree, strongly agree, with 1, 2, 3, 4, 5, 6, 7 points.

TABLE I
VARIABLES AND MEASURE SCALE

Variables	Measure Scale		Resources
Trust in government (TG)	Capability	Governments have sufficient human resources to ensure the steadiness and security of e-government.	Tan,C.W. (2008) Bélangera,F. (2008)
		Governments have technology to ensure information integration	
	Integrity	Governments release and update information in a timely manner without an attempt to hide information from the public.	
		Governments take my maximization benefit into consideration	
Intuition based trust (TS)	Situational Normality	Accessing e-government t is in line with my habits	McKnight (2001)
		I can access e-government services easily	
	Structural Assurance	There are regulations to ensure my right to access e-government services	
		Citizen have right to appeal a denial of access to e-government information and services.	
Disposition to trust (DT)	Faith in Humanity (Believing that human beings are fundamentally loving and good)		McKnight (1998)
	Trusting Stance (Even if I do not have full understanding of the people or the situation, I am willing to trust other people.)		
Perceived usefulness (PU)	E-government is useful		Davis, D.H. (1989) Kumar, N. (1996)
	E-government is more effective than traditional ways		
Perceived ease of use (PEOU)	It's ease to access e-government information and services		Davis, F.D. (1989) Kumar, N (1996)
	E-government is more convenient and faster than traditional ways		
	E-government is more cost-saving than traditional ways		
Trust in e-government (GIT)	I believe I have the right to access the needed government information and services through e-government		Devaraj,S. (2002)
	E-government information and services are reliable		
Intention to Adopt (INT)	I am willing to visit government websites to get government information and services.		McKnight (1998) Gefen(2003)
	I am willing to recommend e-government to others		

B. Data collection ,reliability and validity Test

The survey was carried out via a popular survey website (<http://www.sojump.com/>) on a sample of users with more than 3 years' online experiences. A total of 546 participants returned valid questionnaires, with the rate of valid return of 61.0%.

Confirmatory factor analysis was used to conduct reliability and validity testing to the proposed model. As shown in Table 2, Cronbach α measures the reliability of

all variables. In general, if Cronbach α is greater than 0.7, the data is considered as highly reliable. In our survey, all variables' Cronbach α values are greater than 0.7, which shows a high reliability. Besides, all factor loading coefficients are above 0.5 and significant at 0.001 level. All of the factors' average variance extraction (AVE) is above 0.5, which indicates that the convergent validity for the proposed.

TABLE II
RELIABILITY, VALIDITY TEST FOR ALL VARIABLES

Variables	Measuring items	Factor loading coefficients	Cronbach α	AVE	CR
Government Trust (TG)	TG1	0.740	0.806	0.640	0.876
	TG2	0.700			
	TG3	0.845			
	TG4	0.899			

Institutionbased Trust (TS)	TS1	0.651	0.803	0.565	0.837
	TS2	0.722			
	TS3	0.830			
	TS4	0.791			
Disposition to Trust (DT)	DT1	0.879	0.858	0.716	0.834
	DT2	0.812			
Perceived Usefulness (PU)	PU1	0.907	0.836	0.813	0.897
	PU2	0.896			
Perceived Ease to Use (PEOU)	PEOU1	0.810	0.790	0.616	0.828
	PEOU2	0.786			
	PEOU3	0.758			
trust in e-government (GIT)	GIT1	0.736	0.832	0.682	0.808
	GIT2	0.905			
Intention to adopt (INT)	INT1	0.826	0.806	0.707	0.828
	INT2	0.855			

C. Structural model test

First we need test whether the model and the data matches, which can be described as fit index. Table 3 provides important fit indexes and the recommended values.

Most of the fit indexes in our research are within the range, which shows the high fitting between the model and the data.

TABLE III

FIT INDEXES AND RECOMMENDED VALUES

Fit Index	X2/df	RMSEA	GFI	AGFI	CFI	NFI
Recommended values	<3	<0.08	>0.90	>0.80	>0.90	>0.90
Research Values	1.60	0.05	0.931	0.887	0.996	0.960

D. Hypothesis Test

From the model testing results, H5, H10 and H14 failed the test while other assumption stands. The model shows that trust in e-government has positive influence on citizens' adoption of e-government. The trust factors can be measured in three dimensions: government trust, intuition-based trust and disposition to trust. Among them,

government trust has the most influential effect on citizens' trust in e-government with 0.51. Next comes to institution-based trust, which is 0.35. Disposition to trust does not have a direct effect on e-government trust with total effect of 0.352 (0.45 × 0.51 + 0.35 × 0.35), which can be seen as an indirect influence factor which exerts effects by government trust and institution-based trust

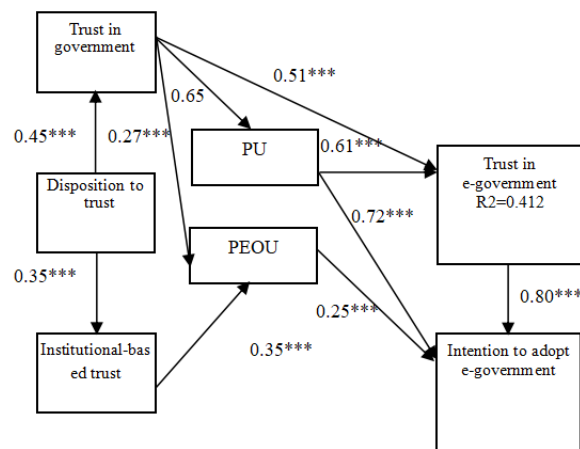


Figure 2. Path Coefficient for model *** significant under 0.001

Meanwhile, consistent with the TAM model, the results show that perceived usefulness and perceived ease of use are positively correlated with citizens' adoptions of e-government. Perceived usefulness has a greater influence (coefficient value of 0.61) on trust in e-government. However, perceived ease of use has no impact on trust in

e-government, because most respondents were aged from 25 to 35 with more than 3 years of Internet experience and these Internet users did not have any problems with using the Internet.

IV. CONCLUSIONS AND SUGGESTIONS

E-government initiatives are in their infancy in many developing countries, including China. The success of the e-government initiatives is dependent on citizens' adoption of e-government. Prior studies show that citizens' trust plays a vital role in promoting e-government adoption. By integrating constructs from the technology acceptance model (TAM), this study proposed a model of citizens' trust in e-government in understanding the impact of trust-related factors on citizens' adoption of e-government initiatives. Several key findings from our survey on Chinese users of government websites are summarized as follows. First, citizens' trust, perceived usefulness and perceived ease of use are significant predictors of citizens' intention to use an e-government service. Second, trust in government and institution-based trust are the major tactics to build citizens' trust in e-government. Although disposition to trust does not affect trust in e-government directly, it exerts an indirect influence through trust in government and institution-based trust. Third, perceived usefulness is also important in building citizens' trust in e-government.

There are several ways in which a government can increase citizens' trust and thus encourage the adoption of e-government services and we offer the following suggestions especially for the Chinese government. First, China has been promoting openness in government affairs in light of its national conditions. Apart from making government information more accessible to the public, the Chinese government encourages open information in departments of the Communist Party of China, legislative and judicial organs, village committees, business organizations and public institutions. With a view to standardizing the disclosure of government information, China promulgated Regulations on Government Information Openness in 2007, which took effect as of May 1, 2008. To improve citizens' trust in government, government information should be released according to Regulations on Government Information Openness in an effort to build a fair and transparent government image. Second, government agencies should improve the regulations for accessing and reusing information available at the government websites, and enhance the judicial relief system to build the increased levels of citizens' institution-based trust. Third, an emphasis should be put on the quality of the information released at the government websites, ensuring the authority, accuracy, utility of the information and ease of maneuverability in an effort to improve citizens' adoption of e-government services.

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