

Consumers' Acceptance Model for Taiwan Agriculture and Food Traceability System

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ABSTRACT Due to globalization, the food-borne illness may cause damage to people's health in various countries. Such scandals resulted in consumers losing confidence in the government's ability to manage food safety. To regain consumers' trust and confidence, many countries placed more emphasis on food traceability, which is capable of recording the details of a specific food as it makes its way from the farm to the table. Accordingly, in 2004, the Taiwan Agriculture and Food Traceability System (TAFTS) were implemented to govern food safety. Being the key stakeholder along the food supply chain, consumers' acceptance to food traceability plays a critical role in the promotion and persistence of the policy. Based on the technology acceptance model (TAM), a consumers' acceptance model is proposed by adding three extra constructs of mobile anxiety (MA), social influence (SI), and perceived limitations (PL). A survey of 380 participants being recruited from two major metropolises in Taiwan is conducted to examine the proposed model via structural equation modeling analysis. The empirical results show that the proposed model possesses good model fits and explanatory power. Some findings identify that perceived usefulness (PU) and perceived ease of use (PEOU) exhibit significantly positive effects while PL has a significantly negative effect on both attitude (ATT) and intention to use (ITU). Besides, ATT partially mediates the relationship between beliefs (PU, PEOU or PL) and ITU. However, due to high Internet usage rate and the popularity of social networks, there is no significant effect between two constructs of MA and ATT, MA and ITU, SI and ATT, or SI and ITU. Finally, some recommendations are provided to policymakers for better implementation of TAFTS.

INTRODUCTION

Due to the globalization of the food supply chain, food spoilage is a risk raised by the long and interconnected process in the global supply chain (Maruchek et al. 2011; Sarpong 2014). For instance, the first United State (U.S.) case of Bovine spongiform encephalopathy (BSE) in Washington State was originally from Canada (Pouliot and Daniel 2008). However, the BSE crisis impacted the beef exporting economy and consumers' confidence on food safety (Ortega et al. 2011). The 2008 Chinese milk scandal, where the milk powder produced by the Sanlu Group was discovered melamine contamination, decreased Chinese consumers' confidence toward dairy industry (Wu et al. 2011) and resulted in

China losing its reputation for food safety worldwide (Roth et al. 2008). However, those scandals pressured the government to apply traceability to assuring the food safety and regaining consumers' confidence (Hobbs et al. 2005; Council of Agriculture 2006; Brummel 2014; Edel and Danny 2014).

Barling et al. (2009) stated that traceability could (1) provide efficient food chain management, (2) apply controls and verification on products, (3) ease food risk management and recall, (4) ensure the processing quality, and (5) enable food quality assurance and provenance. In addition, traceability could enable the manufacturers to track products' sources and ensure food safety, identify sources of infected food or contamination, monitor residue, and meet labeling regulations (Gellynck and Verbeke 2001). Previous studies also argued that traceability could reduce the information asymmetry between consumers and manufacturers (Ortega et al. 2011; Tsai et al. 2012). Accordingly, traceability has been used widely across countries as a tool for food safety management.

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Good Agricultural Practice (GAP) has been applied in Taiwan since the early 1990s, followed with Good Manufacture Practice (GMP) to ensure food-processing industries, manufacturers and farmers following the world-accepted standards to reduce food-borne illnesses and risks. After joining the World Trade Organization (WTO) in 2002, Taiwan experienced severe impact of globalization and market liberalization (Hu 2009). To face these challenges, Taiwan launched the Taiwan Agriculture and Food Traceability System (TAFTS) in 2004. The TAFTS included five categories of data, (1) production which are under the GAP standards, (2) manufacturing which are under the GMP or HACCP standards, (3) distribution, (4) marketing, and (5) consumption records. In other words, food chain stakeholders, such as the government, suppliers, manufacturers, distributors, and consumers, can access to the information provided by suppliers and manufacturers using their mobile devices or home/office computers (Lur 2005).

However, even though traceability can reduce the information asymmetry between consumers and manufacturers, enhance food safety, and minimize food recall costs (Gellynck and Verbeke 2001; Barling et al. 2009; Freddy and Marian 2014; Sylvain and Sebastian 2014), Voss et al. (2009) found that in comparison with price, delivery cost, and quality, food safety was the last concern when the manufacturers chose their suppliers. In addition, elderly farmers, the main working force, have low awareness of food traceability and less motivation to practice TAFTS (Liao et al. 2011) that the government has to address the factors in the public's demands and utilize these factors for improving the administrative effectiveness and providing effective communication and services (Hamner and Qazi 2009).

Cornelisse-Vermaata et al. (2008) addressed food chain stakeholders' preference toward a traceability carrier. Gellynck and Verbeke (2001) emphasized consumers' perception of processing records and functional information. Hobbs et al. (2005) examined how traceability affected the willingness-to-pay and mitigated the information asymmetry. Chen and Huang (2013) studied the interrelationship between consumer purchase intentions and traceability-adoption in fast food restaurants. Ortega et al. (2011) indicated that Chinese consumers were willing to pay a higher

price for certified, labeled, or traceable food. In summary, previous studies mostly focused on the impact of traceability on consumers' willingness-to-pay, cost-risk analysis, and reduction of information asymmetry. As far as we know, only a few studies have focused on consumers' acceptance of traceability.

Extended from Ajzen and Fishbein's (1975) theory of reasoned action (TRA), TAM consists of perceived usefulness (PU), perceived ease of use (PEOU), attitude (ATT), and intention to use (ITU). TRA, developed by Fishbein and Ajzen (1975), suggests that a person's behavioral intention (BI) is influenced by his/her ATT and subjective norms (SN; $BI = A + SN$). The original TAM suggests that people's acceptance of Information System (IS) depends on ITU which depends on people's attitude towards IS, and the attitude is fashioned by people's beliefs (Davis 1989). Several researchers replicated TAM to their studies about IS acceptance after TAM being introduction by Davis et al. in 1989 (Venkatesh et al. 2007). TAM and its extended forms are believed to be effective and concise models predicting people's IS acceptance (Legris et al. 2003). However, unlike the constructs (PU, PEOU, and ITU) in TAM, ATT has not been widely adopted for explaining IS acceptance. Kim et al. (2009) went through 18 literatures and found that ATT would completely mediate, partially mediate or not mediate at all the relation of consumers' beliefs and ITU. Unlike TRA, which states that ATT is a critical mediator, Davis et al. (1989) argued that ATT had no significant mediating effect on ITU and suggested future research being required to address the mediating effect of ATT. Therefore, TAM is use for examining the factors in shaping consumers' ATT and ITU toward the acceptance of TAFTS.

In retrospect, traceability has been adopted by many countries to warrant food safety so that consumers' acceptance toward traceability is critical. Moreover, in order to address the gap of inadequate literatures on traceability acceptance, this study aims at three purposes (1) to propose a consumers' acceptance model for TAFTS by adding three extra constructs to the TAM, (2) to conduct empirical test to the proposed model, and (3) to verify the mediating effects between ATT and ITU. Finally, some recommendations are provided to policymakers for better implementation of TAFTS.

METHODOLOGY

Consumers' Acceptance Model

TAM has been widely used in the studies on user acceptance of information technology, including user acceptance of tele-healthcare system (Chau and Hu 2001; Ilie et al. 2009; Moores 2012), user acceptance of self-serviced online stock trading (Liu et al. 2012), taxpayers' acceptance of e-tax services (Hu et al. 2009), 3G user acceptance (Chong et al. 2009), and consumer attitudes towards mobile payment (Schierz et al. 2010). From the literature, TAM provided a good model to examine consumers' acceptance of information system (IS). Therefore, based on the core constructs of PU, PEOU, ATT, and ITU in the TAM, a consumers' acceptance model is proposed for TAFTS by adding three extra constructs of mobile anxiety (MA), social influence (SI), and perceived limitations (PL).

Core Constructs of TAM

Since 2004, TAFTS has been implemented in Taiwan as a means of assuring food safety. Consumers can look up the records of processing, manufacturing and distribution by using TAFTS. TAM provided a good model for examining the effects of external variables on internal beliefs, attitude, and intention. Several empirical studies stated that TAM was suitable for understanding and explaining IS acceptance (Legris et al. 2003; Liu et al. 2012). Taking TAFTS as an IS, this study includes the core constructs of PU, PEOU, ATT, and ITU in the TAM as parts of the constructs in the proposed model.

Davis (1989) defined PU as "the degree to which a person believes that using a particular IT would enhance his or her job performance" and PEOU as "the degree to which a person believes that using a particular system would be free of effort", such that both PU and PEOU were the main predictors in the TAM. Usually, PU has a profound effect on IS acceptance, while PEOU does not (Igbaria and Iivari 1995; Chau and Hu 2001; Ilie et al. 2009). However, there were other studies (Moon and Kim 2001; Schierz et al. 2010; Liu et al. 2012) suggesting that PEOU had a significant effect on attitude.

Ajzen (1991) defined ATT as the estimation of people's likes and dislikes and the antecedents for predicting consumers' decisions. ATT was also proved to be a key mediator on the

relationship between belief and behavioral-intention (Fishbein and Ajzen 1975). However, Davis et al. (1989) argue that ATT did not fully mediate, but only partially mediated the effects of PU and PEOU. Szajna (1996) and Wu et al. (2011) suggested examining only the effects of PU and PEOU without ATT on ITU toward the acceptance of IS for a higher model fit in comparison with the original TAM. However, Schepers and Wetzel (2007) had proved the validity of constructs in the TAM and identified the mediating effect of ATT after studying 51 literatures. Because of the different opinions among previous studies, the mediating role of ATT, which influences consumers' beliefs and intentions to use IS, should be studied further (Davis et al. 1989). Based on the TAM, this study adopts four constructs of PU, PEOU, ATT and ITU by modifying Davis' questionnaire to develop the following hypotheses regarding the TAFTS.

H1: Perceived usefulness will positively affect attitude toward using TAFTS.

H2: Perceived ease of use will positively affect attitude toward using TAFTS.

H3: Attitude toward using TAFTS will positively affect the intention to use TAFTS.

H4: Attitude toward using TAFTS will partially mediate the effect of perceived usefulness on intention to use TAFTS.

H5: Attitude toward using TAFTS will partially mediate the effect of perceived ease of use on intention to use TAFTS.

Most studies applied the TAM only to examining employees' acceptance of IS, which limited the implication of the TAM (Venkatesh et al. 2012). Accordingly, several researchers suggested that modifying and expanding the TAM for wider applications was necessary (Legris et al. 2003; Holden and Karsh 2010; Lim et al. 2011).

Therefore, three extra constructs modified from the literatures were adopted, including mobile anxiety (MA), perceived limitations (PL), and social influence (SI). Moreover, the effects and degree of these constructs on ATT and ITU regarding TAFTS by using SEM are explored, and the mediation effect of ATT between three constructs and ITU is examined. Further explanations for three constructs of PL, MA, and SI are provided as follows.

Mobile Anxiety (MA)

After Taiwan Council of Agriculture (COA) decided to remove the QR-code scanning device-

es from supermarkets, consumers need to use mobile phones for scanning the QR-code attached on food for accessing the TAFTS. Igbaria and Iivari (1995) indicated that computer anxiety was an irrational feeling experienced by an individual when using computer technology; meanwhile, they also found that computer anxiety had a negative effect on computer usage and PU. Compeau and Higgins (1995) stated that computer anxiety had a significant negative effect on computer usage. Meuter et al. (2003) suggested that technology-related anxiety had a significant effect on technology acceptance. However, the empirical study of Lim et al. (2011) argued that technology anxiety did not have a significant effect on ITU. Therefore, the questionnaire of Igbaria and Iivari (1995) is modified to explore the MA effects on ATT and ITU toward the acceptance of TAFTS.

H6: Mobile anxiety will negatively affect attitude toward using TAFTS.

H7: Mobile anxiety will negatively affect intention toward using TAFTS.

H8: Attitude toward using TAFTS will partially mediate the effect of mobile anxiety on intention to use TAFTS.

Perceived Limitations (PL)

Van Rijswijk and Frewer (2012) concluded that consumers would not spend too much time searching for food information because food was credence goods and a low-involvement product. In comparison with traceability, consumers could access the information by reading labels directly and easily. McCarthy and Barton (1998) stated that consumers were not really interested in accessing the food traceability information. Cornelisse-Vermaata et al. (2008) mentioned that although traceability could reduce information asymmetry by providing more detailed information, stakeholders concerned more about the increasing cost, quality of information, and frequency of information renewal of traceability; therefore, instead of using traceability, they still preferred using the labeling system. Accordingly, it is assumed that the construct of PL, which includes low-involvement of food-purchasing and preference of labeling system, would negatively affect consumers' acceptance of TAFTS.

H9: The perceived limitations will negatively affect attitude toward using TAFTS.

H10: The perceived limitations will negatively affect intention toward using TAFTS

H11: Attitude toward using TAFTS will partially mediate the effect of perceived limitations on intention to use TAFTS.

Social Influence (SI)

Luo (2012), the columnist for Taiwan Trace Org., claimed that consumers in the U.S. were mistaken for corporate espionage while they scanned the traceability code on strawberry package. Asch (1995) concluded that social pressure had an effect on an individual's own opinions from his famous conformity experiments. Rashotte (2009) defined that social influence was influenced by both oneself and others in the decision making process. Qin et al. (2011) indicated that SI had a significant effect on an individual's social network acceptance. Sridhar and Srinivasan (2012) mentioned that an individual's rating for online product was influenced by other people. Ajzen (1972) suggested that social influence was one of the critical factors in the model on decision making. Based on previous discussions, the following are proposed.

H12: The social influence will negatively affect attitude toward using TAFTS.

H13: The social influence will negatively affect intention toward using TAFTS.

H14: Attitude toward using TAFTS will partially mediate the effect of social influence on the intention to use TAFTS.

In retrospect, this study applies core constructs (PU, PEOU, and ATT) of TAM and adds three extra constructs of PL, MA, and SI, to examine their effects and degree on attitude and ITU as well as to identify the mediating effects of attitude between beliefs and ITU. The proposed consumers' acceptance model for TAFTS is presented in Figure 1.

Research Method

The survey questionnaire consists of three major parts. First, instructions for using and downloading the TAFTS APP and three TAFTS samples are given. Second, 19 items using the Likert 7-scale with 1 being strongly disagree and 7 being strongly agree for measuring the proposed constructs are provided. The items relating to the constructs, PU, PEOU, ATT, and ITU are modified from Davis (1989) and Egea and

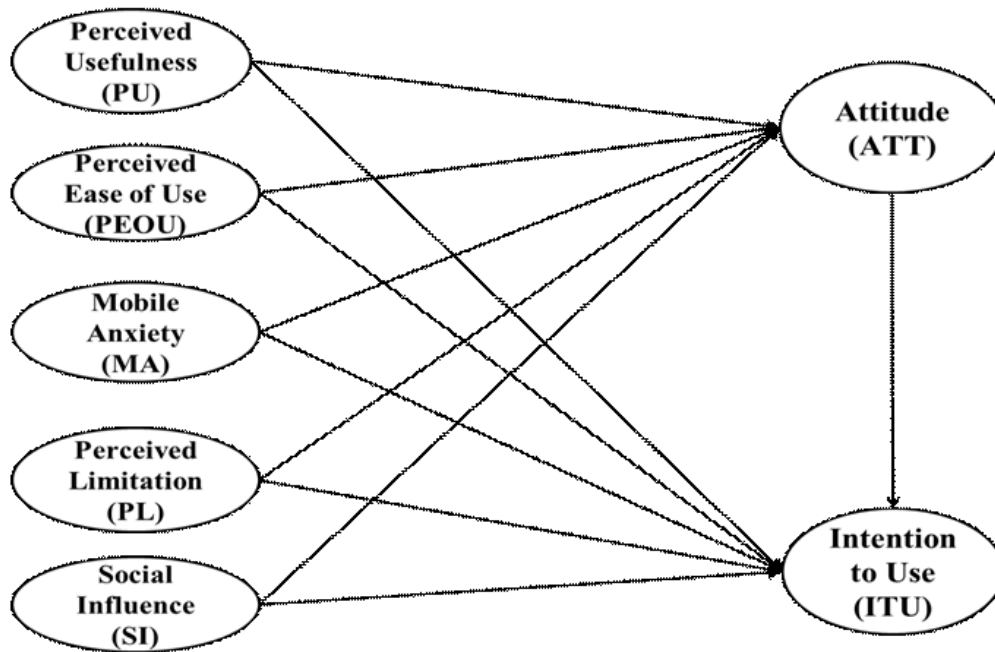


Fig. 1. The proposed consumers' acceptance model for TAFTS

González (2011). The items measuring MA are modified from the studies of Liu et al. (2012) and Venkatesh and Davis (2000). Two items relating to PL are modified from Van Rijswijk and Frewer (2012). Finally, two items for measuring SI are self-developed, which are discussed and agreed by two marketing professors. Last, some questions regarding demographic items such as gender, income, etc. are given. In 2013, there are approximately 30 million mobile users in Taiwan (Evans 2013), while 3G users represent 75 percent of total mobile users. The number of registered mobile users has surpassed the total population in Taiwan (Liu 2012). Participants from supermarkets and traditional food markets in Taipei and Kaohsiung metro areas, where the population possesses higher mobiles and fixed-internet usage, are randomly recruited by trained interviewers to join the survey. Participants are required to be over 18 years old and have a smartphone. For the survey procedure, each participant follows the instructions to download the traceability application, scans the samples of QR-code, and reads the traceability information in their smartphones. After then, they are asked to fill out the survey questionnaire.

Finally, 380 validated data were collected among 435 participants in traditional markets and supermarkets. Ghiselli et al. (1981) suggested a sample size larger than 300 being appropriate for most research. According to Hair et al. (1998), the ratio of the sample size to the number of items on the questionnaire should be at least 5:1. There are 35 items for measuring in the proposed questionnaire, therefore, the 380 valid samples are deemed sufficient because it is more than the researchers' recommended sample size.

Chin (1998) stated that structural equation modeling (SEM) enabled researchers to apply path analysis with latent variables and was capable of building models and estimating the relations between the variables. Hair et al. (1998) stated that SEM was able to examine the multiple relations simultaneously and improve the statistical efficiency, comprehensively estimate the relations between constructs, and transfer exploratory factor analysis to confirmatory factor analysis easily, which particularly suited for large-scale model and the entire theoretical framework. Therefore, AMOS 20 is applied to conducting the SEM analysis of the empirical data.

RESULTS

In this section, some descriptive statistics are presented first. By applying two-step approach to test the measurement model and the structural model (Hair et al. 1998), the effects and degrees of PU, PEOU, MA, PL, and SI regarding acceptance of TAFTS are analyzed then. Finally, the mediation effects of ATT between beliefs and ITU are investigated.

Descriptive Statistics Analysis

Three hundred eighty (380) participants were recruited from Taipei (212) and Kaohsiung (168) respectively. The majority of the respondents were female (236). There were 293 individuals (77%) in charge of routine food shopping. 231 participants lived with family with children, 99 lived with family without children and 50 were single. 122 had graduate degrees, 255 had undergraduate degrees and 33 were high-school graduates. 183 (48%) heard about the promotion of TAFTS, 79 (21%) had used TAFTS before and 227 (60%) had used mobile services (looking for restaurants, viewing maps, downloading music, etc.) within the last three months. Even though most participants were aware of food safety (mean=6.4, stdev=1.06) and concerned about

food safety issues in the media (that is, food safety news concerns mean=6.17, stdev=1.06), only 21% of the respondents had used TAFTS, contrary to the expectations.

Measurement Model

Moore (2012) suggested that item loading should be greater than 0.6 or even 0.7 to ensure the convergent validity. Chau and Hu (2001) suggested that factor loadings should be greater than 0.6 for every construct. The factor loadings for the proposed model ranged from 0.73 to 0.97, which were all greater than 0.7.

Composite reliability (CR) and average variance extracted (AVE) were commonly used for evaluating the convergent validity (Lee et al. 2007). For ensuring the convergence, CR should be greater than 0.7 and AVE should be greater than 0.5 (Fornell and Larcker 1981). As shown in Table 1, the CR ranged from 0.758 to 0.925, which presented a high internal reliability; AVE ranged from 0.611 to 0.805, which was higher than the recommended figures. Accordingly, the proposed model fitted the criteria for convergent validity.

Fornell and Larcker (1981) argued that whenever square root of AVE was greater than the inter-constructs correlation, it met the criterion of discriminant validity (Hung et al. 2013). As

Table 1: Factor loadings and convergent validity of the measurement

Construct	Items	Factor loading	Composite reliability	AVE
PU	TAFTS helps me to discover desirable information.	0.82	0.907	0.764
	TAFTS helps me choose desirable food.	0.90		
	TAFTS helps me choose safe food.	0.90		
PEOU	It is easy to download the TAFTS APP for my mobile device.	0.87	0.925	0.805
	It is easy to use TAFTS.	0.89		
	It is easy to learn and use TAFTS.	0.93		
PL	It is not necessary to use TAFTS, since I do not spend much time buying food.	0.83	0.758	0.611
	It is not necessary to use TAFTS, since I am satisfied with the nutrient facts and ingredients labels.	0.73		
MA	I am confused about looking for information on my mobile device.	0.87	0.805	0.701
	I think the mobile screen is too small to look for information.	0.83		
	I feel anxious when looking for information on my mobile device.	0.81		
SI	I think the shop assistant will stop me from using my mobile device to take photos of products.	0.79	0.877	0.783
	The shop assistant may be suspicious of my intentions when I use a mobile with a TAFTS APP to scan food.	0.97		
ATT	I think it is important to promote TAFTS.	0.85	0.909	0.770
	I should buy food with TAFTS certification.	0.92		
	I should buy food with TAFTS certification to assure food safety.	0.86		
ITU	I will recommend TAFTS to others.	0.89	0.925	0.805
	I think it is meaningful to use TAFTS.	0.93		
	I will use TAFTS in the future.	0.87		

Table 2: Fornell–Larcker criteria of square root of AVE and inter-constructs correlation

	<i>PU</i>	<i>PEOU</i>	<i>PL</i>	<i>MA</i>	<i>SI</i>	<i>ATT</i>	<i>ITU</i>
<i>PU</i>	0.874						
<i>PEOU</i>	0.514	0.897					
<i>PL</i>	-0.093	-0.212	0.782				
<i>MA</i>	0.060	-0.323	0.476	0.873			
<i>SI</i>	0.286	0.064	0.331	0.406	0.885		
<i>ATT</i>	0.639	0.483	-0.189	-0.008	0.186	0.877	
<i>ITU</i>	0.679	0.546	-0.327	-0.070	0.192	0.838	0.897

shown in Table 2, the square roots of AVE ranged from 0.782 to 0.897 and were all greater than the inter-constructs correlation. Thus, the proposed model met the criterion of discriminant validity.

Moore (2012) suggested that cross-loading was another criterion used for testing the discriminant validity. A model possessed the discriminant validity if its cross-loadings were insignificant. In addition, Lee et al. (2007) stated that loadings measured the correlation between the component scores of latent variables and the indicators of other latent variables, whereas cross-loadings measured the correlation between the component scores of a latent variable and the indicators of the same latent variable. Since the cross-loadings were all less than 0.4 while item loadings were all higher than 0.6, the proposed model met the criterion of discriminant validity.

Structural Model

In terms of path coefficients showed in Figure 2, *PU* exhibited a significant effect on *ATT* (standard regression weight (β) = 0.484, regression weight (*B*) = 0.464, $t=7.939^{***}$), followed by *PEOU* ($\beta=0.223$, $B=0.172$, $t=3.746^{***}$). In contrast, *PL* exhibited a significantly negative effect on attitude ($\beta=-0.159$, $B=-0.113$, $t=-2.522^*$). However, both *MA* and *SI* showed no significant effect on *ATT*.

Furthermore, *ATT* exhibited the most significant effect on *ITU* ($\beta=0.597$, $B=0.687$, $t=11.974^{***}$), followed in turn by *PU* ($\beta=0.187$, $B=0.213$, $t=4.052^{***}$) and *PEOU* ($\beta=0.116$, $B=0.106$, $t=2.634^{**}$). Similarly to the case of *ATT*, *PL* had a strongly significant negative effect ($\beta=-0.208$, $B=-0.17$, $t=-4.448^{***}$), while both *MA* and *SI* showed no significant effect on *ITU*.

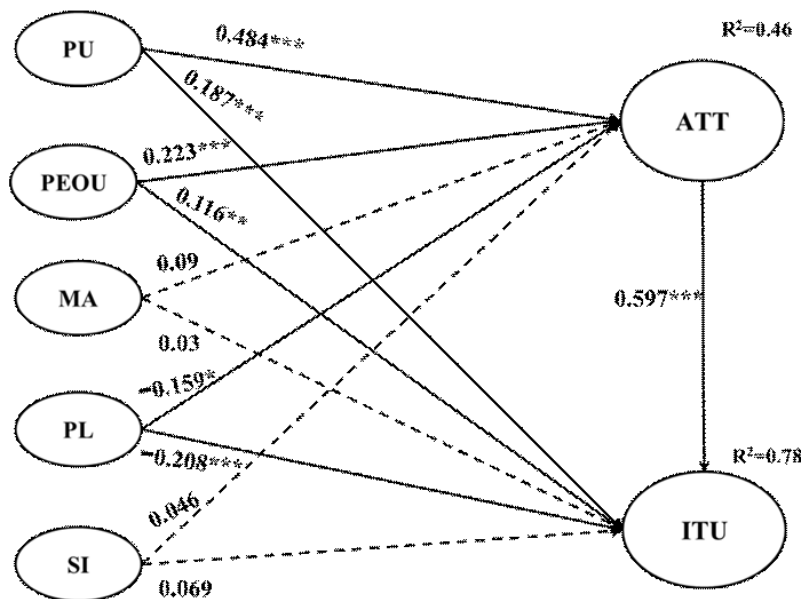


Fig. 2. Results of SEM analysis. ($p < 0.001$, $t\text{-value} > 3.340$; $p < 0.01$, $t\text{-value} > 2.601$; $p < 0.05$, $t\text{-value} > 1.972$)

Therefore, the results showed that the relationships between MA-ATT, SI-ATT, MA-ITU, and SI-ITU were insignificant. Therefore, the hypotheses H1, H2, H3, H9, and H10 were supported, but the hypotheses H6, H7, H12, and H13 were not supported.

As shown in Table 3, according to the recommended criteria by Doll et al. (1994), the results of the proposed model such as GFI=0.923>0.9 was good and AGFI=0.888>0.8 was acceptable. Also, by Hu and Bentler (1999), TLI=0.961>0.95, CFI=0.970>0.95, RMSEA=0.058<0.06 and SRMR=0.0357<0.06 were all fitted good. In conclusion, the proposed model fitted all the recommended criteria and had a good model fit.

Moreover, five constructs of PU, PEOU, PL, MA, and SI explained 46% variance of ATT, while the full model including ATT as a mediator in Figure 2 explain 78% variance of the intention to use TAFTS. In summary, the proposed model had the optimal fit to consumers' acceptance for TAFTS.

ATT as a Mediator

Fishbein and Ajzen (1975) stated that attitude was an important mediator between beliefs and the behavioral intention. However Davis et al. (1989: 999) found the partial mediation or even no mediating effect of ATT between beliefs and intention to use IT and suggested researchers to further study the circumstances where ATT played as the mediator. Therefore, the direct, indirect and total mediated effects of ATT between beliefs and ITU with AMOS 20 were analyzed.

However, the cases of SI-ITU and MA-ITU were not discussed due to the insignificant total effect of SI and MA on ITU.

By utilizing the bias-corrected percentile method, the direct and indirect effects of PU on ITU were $p=0.033^*$ and 0.001^{***} , respectively; also, those effects of PEOU on ITU were $p=0.037^*$ and 0.001^{***} ; and those effects of PL on ITU were $p=0.002^{**}$ and 0.007^{**} . The results showed that PU, PEOU, and PL exhibited significantly direct and indirect effects on ITU; hence, ATT partially mediated users' beliefs (PU, PEOU, and PL) and ITU. Accordingly, H4, H5, H8, H11, and H14 were supported.

Furthermore, PL exhibited a strongly negative effect on ATT and ITU, and PL exhibited a relatively weak-negative total effect ($\beta=-0.154$) on ATT while a relatively strong-negative total effect on ITU ($\beta=-0.302$); hence, PL contributed an effect on the gap between ATT and ITU toward TAFTS.

DISCUSSION

By testing the discriminant validity, convergent validity, and reliability, the proposed consumers' acceptance model in Figure 2 explains 78% variance of the intention to use TAFTS. Therefore, the proposed model satisfies the recommended criteria of model fits.

Lee et al. (2007) studied the multimedia message service and suggested that playfulness and PEOU had significant effects on acceptance of mobile service. In this study, PU exhibits the strongest effect on ATT toward using TAFTS.

Table 3: Model fit indices for the proposed model

	Recommended criteria	Proposed model
ATT R^2		46%
ITU R^2		78%
Chi-square		296.88
Degrees of Freedom		131
Norm Chi-square (X^2/df)	between 1-3	2.266
Goodness of Fit (GFI)	> 0.9	0.923
Adjusted Goodness of Fit (AGFI)	> 0.9 good; > 0.8 acceptable	0.888
Root Mean Squared Error of Approximation (RMSEA)	< 0.06	0.058
Standardized Root Mean Squared Residual (SRMR)	< 0.05	0.0357
Tucker-Lewis Index (TLI)	> 0.95	0.961
Comparative Fit Index (CFI)	> 0.95	0.970

Note: Model's values of GFI and AGFI larger than 0.8 are acceptable, which values large than 0.9 are good fit (Doll Xia and Torkzadeh 1994); TLI, CFI should be larger than 0.95 and RMSEA, SRMR should be smaller than 0.06 (Hu and Bentler 1999).

(0.49), which reflects the respondents' thought of usefulness being the main reason for using traceability and also in line with the suggestions (Hu et al. 2009; Arbore et al. 2014), where PU has a greater effect than PEOU on technology acceptance. As shown in Figure 2, PU has a stronger effect on ATT and ITU in comparison with PEOU. Therefore, it is proposed that PU is the major predictor toward consumers' acceptance of TAFTS.

For MA, consumers conduct different activities on their mobile devices, which have become an indispensable part of their daily lives (Mort and Drennan 2007). In Taiwan, with high mobile device popularity and convenient IT environment (Hung and Wu 2012), the mobile phone penetration rate has already exceeded 100% (Cheng 2008). A survey by Internet World Stats (2012) also indicated that Taiwan had a high Internet usage rate (79%). In retrospect, 60% respondents of this study have used m-services within the last three months. Furthermore, the finding of MA being not statistically significant on ATT and ITU is in line with Lim et al. (2011) who suggested that technology anxiety exhibited no significant effect on the intention to use software.

In terms of the effect of SI on ITU, with the popularity of social networks (Facebook, blogs, etc.), taking photos in public and uploading those to share with friends become normal. In other words, using smart phones to photo TAFTS codes would be the common allowance and understandable behaviors between shopkeepers and consumers. The finding shows no significant effect of SI on ATT and ITU, which reflects the current society trends in Taiwan.

The participants are aware of the importance of TAFTS and food safety (mean=6.4). Among 380 participants, 60% have used mobile services within the last three months and 48% have heard about TAFTS; however, only 21% have the experiences in using TAFTS. This phenomenon is coincident with the result that PL contributes an effect on the gap between ATT and ITU toward TAFTS, and the conclusion by Zafar et al. (2004) that consumers do not spend too much time on low-involvement products.

Besides, if consumers have no motive to transfer to or accept new policy/service, they will still be in the same old pattern (Van Dijk et al. 2008). In other words, a new decision support system has to meet the users' needs, including an existing value, a past experience, and a cur-

rent need (Hung and Wu 2011). Otherwise, consumers still prefer using labels for food-purchasing reference because of the hesitation with a new system (Cornelisse-Vermaata et al. 2008; Magdalena et al. 2014). However, along with a stronger link between food and consumption safety and improved consumer awareness of food safety, consumers will be concerned more about safety issues and redefine food as a search good from a credence good (Van Wezemael et al. 2010; Fernqvist and Ekelund 2014). By providing rewards or taking effective strategies, the government should enhance consumers' awareness of food safety and encourage them to use TAFTS.

This empirical study is in line with the suggestions of Legris et al. (2003) and Venkatesh et al. (2012) in adding more constructs to expand TAM applications to consumer acceptance for TAFTS by collecting survey data from real consumers, instead of students. Although MA and SI do not exhibit significant effects, they reflect this new era of social networking in which mobile devices increase the value of entertainment and the acceptance of m-services (for example, e-bank, e-tax and TAFTS). In summary, PU and PEOU are the key factors in the acceptance while PL exhibits the effect on the prediction of ITU. Meanwhile, the partially mediated effect of ATT is validated using AMOS to test the indirect, direct, and total effects between beliefs and the intention to use TAFTS.

CONCLUSION

Government cannot implement TAFTS efficiently without consumers' acceptance. In this study, finding that PL and PEOU had a significant positive effect on acceptance, whereas PL had a significantly negative effect on it. Therefore, decreasing PL and increasing PU and PEOU would improve the traceability acceptance. In other words, improving the awareness of food safety and knowledge has a positive effect on traceability acceptance and increase the willingness to pay. In accordance with the results of our survey that 48% of the respondents heard about TAFTS and only 21% used TAFTS, we suggest that the Taiwanese government should strengthen consumers' knowledge of food safety and TAFTS to ensure diet safety.

However, TAM presents a good explanation for examining users' IS acceptance but has been criticized for focusing on examining student sam-

ple and office automation software, and those measurements rely on self-reported materials. In contrary to previous criticizes, this study's 293 respondents (77%) are in charge of routine food shopping. In other words, the majority of the respondents of this survey are the main food shopper; therefore, we mended this shortcoming related to the TAM limited employee sample. With respect to the mediated effect of attitude, our findings indicated that ATT partially mediated beliefs-ITU relationship. However, since this is the first study to explore relationship among beliefs, ATT, and ITU on Taiwan consumers' TAFTS acceptance, we suggest that further study is necessary.

Based on core constructs of TAM, this study developed a consumer's acceptance model toward TAFTS by adding three other constructs (PL, SI, and MA). With good model fit, our proposed model explains 46% of the variance of attitude toward TAFTS and 78% of the variance of intention to use TAFTS although SI and MA were not significant. This study not only validated the critical influences of PU and PEOU, but also identified PL as the determinant toward consumer's TAFTS acceptance, and built the foundation for further studies in ATT mediation effect on beliefs-ITU. In summary, this study proposed a concise model of evaluating consumer's TAFTS acceptance, and which provide policy makers a tool to better implement of TAFTS's performance and promotion.

RECOMMENDATIONS

Considering the findings of this study, following recommendations can be put forward:

1. **Improve/ Decrease Effects Of Influencing Factors on Consumers' TAFTS Acceptance:** TAM was normally used for identifying the positive effect on acceptance. However, in this study, we addressed both positive and negative effects of factors on traceability acceptance. Also, our proposed model explained 78% of the variance of intention to use TAFTS. Additionally, we identified that PL, which caused by efficient labeling system and low involvement toward food, exhibited a negatively significant effect on consumers' attitude toward TAFTS and their intention to use TAFTS. Accordingly, with this concise consumer's acceptance model of TAFTS and critical results of

this study, government agency should develop good strategies to improve consumer's PEOU and PU, decrease PL to TAFTS for better TAFTS implement.

2. **Consumers' Acceptance of Using Health-Related Marketing APP is Increasing:** In this study, we found that the MA and SI did not have a significant effect on traceability acceptance, which reflected that using smart phone as a scanning device to access TAFTS has been widely accepted, and which behavior will not induce consumers' anxiety and embarrass. More marketing APPs for the field of public health were needed in order to motivate additional consumers for better food intake choice. We suggested that interactive functions, food hygiene knowledge or other attractive elements could be included in TAFTS to enhance the knowledge and awareness of food safety for consumers.

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