UNDERSTANDING SWIFTLET-HOUSE FARMERS' ACCEPTANCE OF BIO-QR CODE FOR THE EDIBLE BIRD NEST TRACEABILITY SYSTEM: A CONCEPTUAL FRAMEWORK

Praparast AUSAWANETMANEE[1], Sanong EKGASIT[2], Achara CHANDRACHAI[3] and Viwat VCHIRAWONGKWIN[2]

[1] Graduate School, Chulalongkorn University, Thailand; praparast.a@gmail.com
[2] Faculty of Science, Chulalongkorn University, Thailand; sanong.e@chula.ac.th (S. E.); viwat.v@chula.ac.th (V. V.)
[3] Chulalongkorn Business School, Chulalongkorn University, Thailand; achandrachai@gmail.com

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ABSTRACT

Edible Bird Nest (EBN) is a popular and expensive cuisine among Chinese ethnicities. Food safety issues repeatedly confronted the EBN industry because of no systematic standard to certify the product. As a result, China, the world's largest EBN importer, issued new import regulations demanding traceability systems as a standard requirement for legal EBN importation. The new rules impacted Thailand, which used to be the biggest exporter of EBN after Indonesia and Malaysia. Currently, Thailand's market share of legal EBN export to China is less than 1%. The purpose of this paper is to present a conceptual framework (CF) for understanding swiftlet-house farmers' acceptance of Bio-QR codes for the EBN traceability system. From the literature we reviewed, we constructed the framework based on an extended Technology Acceptance Model (TAM) consisting of six factors (PU, PEOU, AT, SN, PI, IN), additional three variables (CBP, JR, RD) related to PU, and two variables (SE, COT) associated to PEOU. This CF will be used in future research to develop a far superior traceability system based on the needs and limitations of users. We hope our new system is widely accepted in order to support Thai EBN's quality, meet international standards, and regain customer trust.

Keywords: Edible Bird's Nest, Swiftlet-House Farmers, Traceability System, Technology Acceptance Model

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INTRODUCTION

"Edible bird's nest - EBN" comprises thick and glutenous saliva secretion and a few feathers from the bird's plumage (Cranbrook, Lim, Koon, & Rahman, 2013). Only two swiftlet species (*Aerodramus fuciphagus* and *Aerodramus maximus*) (Manchi & Sankaran, 2014) in the Apodidae family (Ramji, Koon, & Rahman, 2013) can produce EBN: White-nest Swiftlet and Black-nest Swiftlet (Looi & Omar, 2016). These birds are primarily found in Southeast Asian countries like Indonesia, Malaysia, and Thailand (Lee et al., 2017). Consumers refer to EBNs as the "Caviar of the East" (Thorburn, 2014) and consider it a valuable cuisine, especially among the Chinese community (Yeo et al., 2021), because it is not only one of the most expensive animal-source foods (ASFs) (Thorburn, 2015) but it also has nutritional value and is a functional food that benefits to health (Chantakun & Benjakul, 2022). Nowadays, the EBN business is developed from approving concessions to harvest the nests from the swiftlet inherent habitats called “Cave-nests” to collecting from swiftlet farms known as “House-nests.” Swiftlet farm is an artificial shelter modeled after the natural habitats of swiftlet (Chua & Zukefli, 2016). More than 222,000 swiftlet farms are estimated to exist in three major EBN exporting countries: Indonesia, Malaysia, and Thailand (Connolly, 2017; Jandam, 2017; ThaiGov, 2020). Approximately 82% of global EBN exports are shipped to the Chinese market (Zhang, Ha, Seck, & Zhou, 2020), where EBN trade increased dramatically from 2014 (3.1 tons) to 2020 (336.8 tons) with a CAGR of 129.24% (only for EBN legal imports) (CAIQ, 2021), with an estimated market value of 30 billion Yuan or 150 billion Baht (Chinanews, 2020; DITP, 2021). EBN is sold for between 2,000 and 10,000 USD per kilogram (Babji, Nurfatin, Etty Syarmila, & Masitash, 2015).

The EBN industry has struggled with the risk of food safety issues consistently due to lacking product quality control standards. One of the biggest food safety scandals in the EBN industry occurred in 2011 when the Chinese government discovered nitrites in imported bird's nests containing up to 4,400 mg/kg of the substance (Paydar et al., 2013; Thorburn, 2015). Nitrite content standards in EBN indicate a daily intake of no more than 30 mg/g (Chua & Zukefli, 2016). Excessive nitrite consumption causes neural tube defects (NTDs), chronic disease, and cancer. Following this event, the Chinese government issued a standard regulation for the legal import of the EBN, utilizing a traceability system to trace back products' histories (Sukantapong, 2020). Thailand was one of the world's largest EBN exporters before the new regulation (Jamalluddin, Tukiran, Fadzillah, & Fathi, 2019); however, following the new rule, the market share of legal Thai EBN export to China in 2018 was less than 1% (Sukantapong, 2019). This is because only two Thai export companies have met the criteria for becoming legal EBN exporters in the Chinese market; additionally, both companies can only export Cave-nest (ACFS, 2017). To address the issue causing the decrease in market share, the Thai EBN industry must improve product quality by adhering to an international standard of implementing traceability systems to regain customer confidence. As a result, researchers decided that it is necessary to develop a better traceability system that can meet the needs and limitations of swiftlet-house farmers while encouraging widespread adoption of the new system as soon as possible.

To better understand the traceability system, we will bring our system's concept to swiftlet-house farmers to study acceptance. The Bio-QR Code for the EBN traceability system is our system concept. We create the conceptual framework (CF) prior to our future research. The objective of this paper is to propose a CF for determining swiftlet-house farmers' acceptance of Bio-QR codes for the EBN traceability system. This paper is divided into five sections: Section 1 is an introduction, Section 2 is a review of the literature to determine the appropriate factors for designing the CF, Section 3 describes our methodology, and Section 4 describes how to build the model. The conclusion is the final Section 5.

LITERATURE REVIEWS

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is a highly customized model for predicting user adoption of the information technology (Davis, 1989). The TAM's initial launch focused on determinants that lead to controlling people's behavioral intentions (Venkatesh, Morris, Davis, & Davis, 2003). The main principle of TAM is to predict intrinsic variables (beliefs, attitudes, and intentions) using extrinsic factors (Davis, Bagozzi, & Warshaw, 1989). The model attempted to achieve these objectives by incorporating two significant external variables, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), as factors influencing Technology Acceptance (Davis et al., 1989) (Figure 1b). TAM has been used by many researchers to study and comprehend the forecast of technology acceptance in a variety of fields. They have also begun to apply this theory to the study of food traceability acceptance behavior (Kim & Woo, 2016; Kumar, Upreti, & Mohan, 2022).

The development of TAM2 continued the issues of studying the acceptance and implementation of information technology in the workplace (Venkatesh & Davis, 2000). Venkatesh and Davis developed TAM2 to gain a better knowledge of Perceived Usefulness (PU) factors. Two additional sets of variables were introduced to the new model: The first group is social influence, which is made up of two variables: Subjective Norm (SN) and Image (IM). The second is the cognitive instrumental process: Job Relevance (JR), Output Quality (OQ), and Result Demonstrability (RD) are the three variables included in this process (Venkatesh & Davis, 2000) (Figure 1c). According to TAM2, "individuals create perceived usefulness judgment in part by cognitively evaluating what a system is capable of doing with what they need to get done in their job" is the function of the Cognitive Instrumental Process (Al-Gahtani, 2016). The elimination of the intrinsic variable (Attitude) was a key finding in TAM improvement. As a result, Intention (IN) was the only internal factor directly influencing behavioral prediction, and an additional extrinsic variable (Subjective Norm) was used as a predictor of behavioral intention in the new model to study the behavioral intention to accept technology rather than the original concept.

Recently, Venkatesh and Bala advanced the TAM model to TAM 3 by incorporating six factors from TAM 2 to better understand PEOU (Figure 1 d). Their concept included two types of factors. The first group was known as "Anchor" which is defined as the "general beliefs about computers and their use" (Venkatesh & Bala, 2008). This has four variables: Computer Self-efficacy, Perception of External Control, Computer Anxiety, and Computer Playfulness. "Adjustment" was the name of the other group composed of the two variables, Perceived Enjoyment, and Objective Usability. Anchors were recommended as PEOU preliminary judgment drivers. As a result, after the firsthand experience with the new technology, people's perspectives will shift (Venkatesh & Davis, 2000). This modification is known as “Adjudgment” in TAM 3 (Venkatesh & Bala, 2008).

Theory of Reasoned Action (TRA)

Although TRA is the foundation of TAM, TAM focuses on predicting the behavior of individuals in the organization's working environment (Davis, Bagozzi, & Warshaw, 1992) rather than forecasting people's acceptance of technology in general. However, this CF intends to test with swiftlet-house farmers, who are considered an independent profession and are likely to be individualistic, as opposed to being under the control of an organization. The Theory of Reasoned Action (TRA) is one of the most influential human behavior theories (Sheppard, Hartwick, & Warshaw, 1988). This theory holds that behavioral intention determines an individual's behavior, whereas attitudes and subjective norms directly influence the intent to perform the behavior (Figure 1a). Individuals' attitudes (AT) toward the intended target behaviors can be positive or negative (Fishbein & Ajzen, 1975). People with positive attitudes toward this behavior will demonstrate their intent to perform (Davis et al., 1989). Subjective

Norm (SN) refers to individuals' perceptions of whether or not to perform behaviors based on guidance from decision-makers reference groups (Ajzen, 1991). Another explanation for SN and IN is that people may choose to perform a specific behavior even if they do not like the action or the results. However, if their significant reference groups support it, this motivation is sufficient for them to follow (Venkatesh & Davis, 2000). IN was positively influenced by both variables (Hartwick & Barki, 1994; Venkatesh et al., 2003).

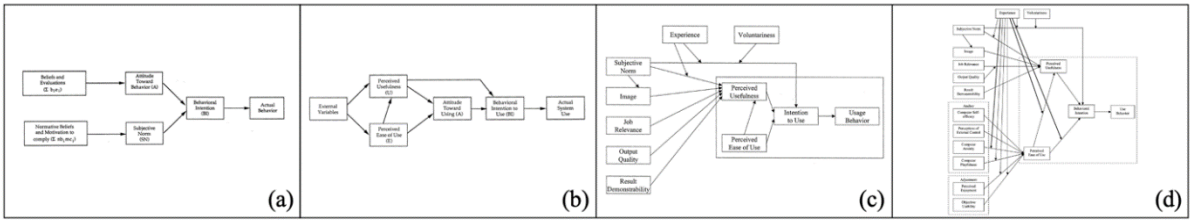

Figure 1 Conceptual framework (CF) from theory (a) TRA (Davis et al., 1989) (b) TAM 1 (Davis et al., 1989) (c) TAM 2 (Venkatesh & Davis, 2000) (d) TAM 3 (Venkatesh & Bala, 2008)

Diffusion of Innovation (DOI)

Rogers defined DOI as "when new ideas are invented, diffused, and adopted or rejected, resulting in certain consequences, social change occurs" (Rogers, 1983). The theory, like TAM, is associated with predicting behavior. DOI, according to Rogers, is a communication process aimed at persuading people to adopt new ideas. There are factors involved in the transmission of ideas. Messages for communication, according to this theory, are information about the innovation. Second, the process involves senders and receivers who are members of the social system communicating information about new ideas. Accepting new ideas is the expected behavior after receiving data via information exchange. Therefore, anticipating innovation acceptance also depends on the receivers' characteristics. Different types of adopters will produce different results. The acceptance of new ideas is also dependent on individual characteristics (Barton & Deschamps, 1988) because some people are more willing to try new things than others. The concepts correspond to Rogers', Agarwal, and Prasad's Personal Innovativeness (PI). PI is classified as one of the adopter types, which means "an individual's willingness to try out any new information technology" (Agarwal & Prasad, 1998; Rogers, 1983). While Hurt and colleagues defined innovation as the "willingness to change" (Hurt, Joseph, & Cook, 1977). Thus, Personal Innovativeness (PI) is well-suited to measuring new system acceptance behavior via Intention (IN) (Agarwal & Prasad, 1998; Koivisto, Makkonen, Frank, & Riekkinen, 2016). Aside from adopter characteristics, DOI also includes ideas about innovation attributes. "Complexity" is one of the innovation attributes in this theory (the others are Relative Advantage, Compatibility, Trialability, and Observability) related to the qualification of technologies that will impact the tendency to accept them. According to Rogers and Shoemaker, it is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers & Shoemaker, 1971).

Cost and Benefit Paradigm

According to Wright's statement, cost-benefit analysis is a simple and appropriate strategy consumers choose when looking for a decision-making technique (Wright, 1975). The goal of this analysis is to propose a consistent, repeatable method for estimating the judgment (Dreze & Stern, 1987). It is a decision strategy that employs a comparison procedure to assess the expected benefits of implementing new technology and the cost of doing so (Payne, 1982). Davis's study included comments on the Cost and Benefit Paradigm (CBP), a behavioral decision theory relevant to PU and PEOU (Davis, 1989). Similarly, Venkatesh et al. stated the concept of marketing research by evaluating the monetary cost/price versus the quality of

products and services to determine the value of goods and services, and they referred to this idea and defined the price value variable as "Consumers' cognitive trade-off between the perceived benefits of the application and the monetary cost of using" (Venkatesh, Thong, & Xu, 2012). For Mitchell & Beach, costs included money, time, and effort (Mitchell & Beach, 1978). It differed from what Venkatesh and the team consider monetary costs; additionally, they believed that when the benefits of using technology outweighed the financial cost, this factor positively affected Intention (IN) (Venkatesh et al., 2012). In conclusion, the costs, whether financial or otherwise, negatively correlated with the acceptance of innovation. The cheaper the invention, the more likely it will be widely used (Leong, Hew, Tan, & Ooi, 2013; Tornatzky & Klein, 1982). Payne defined benefit as "the likelihood that the strategy will lead to a "correct" decision, the speed with which the decision is made, and its justifiability" (Payne, 1982). As with the cost concept, the benefits of innovation may include more than just financial benefits to decision-makers.

RESEARCH METHODOLOGY

To design the conceptual framework (CF), we began by conducting a literature review on theories related to decision behavior and the adoption of the new system. Finally, the researchers selected TAM as the primary theory for designing our CF. TAM was designed to explain users' behavior regarding technology acceptance, according to our purpose in creating this CF to use for understanding the behavior of swiftlet-house farmers in adopting Bio-QR code for the EBN traceability system, the newly developing traceability uses imaging technology (QR Code) and IT technology (Smartphone) to access the bird nests' history database. TAM is thus appropriate for building this conceptual framework because it is congruent with our goal for two reasons. First, this model is a model for predicting user acceptance behavior, which is what we want to know and understand. Second, TAM is a technology-focused adoption model in which our systems also use IT technology. To begin our review of the literature, we chose articles from the original theoretical papers of the authors who developed TAM. These documents are still popular among scholars and are used in various fields of study. We also researched other theories that the TAM developers referred to in order to find concepts that were consistent with our work and capture additional variables of interest. We then explored samples of how our interested variables were adapted in their writings. We also examined papers from the same field that used TAM in their research. Scopus, Google Scholar, ScienceDirect, and Google were the databases used to search for articles. We chose articles with a high number of citations to screen, and when we reviewed the abstracts, the papers were consistent with our aims (Table 1).

Table 1 (a) Summary of the literature describing the variables of interest which will be adopted in this Conceptual Framework (b) Examples of hypothesis derived from the reviewed literature, which is an additional hypothesis from the variable in TAM 1

(a)

Authors	Factors Mentioned in the Literatures											Relationship between Factors from Papers' Conceptual Framework	Citation
	PU	PEOU	CBP	JR	RD	SE	COT	AT	SN	PI	IN		
Venkaesh & Davis, 2000	×	×		×	×				×		×	PU&PEOU-> IN, SN-> PU&IN, JR->PU, RD->PU	27270
Venkatesh & Bala, 2008	×	×		×	×	×			×		×	PU&PEOU->IN, SN->PU&IN, JR->PU, RD->PU, SE->PEOU	8295
Davis, 1993	×	×						×			×	PU&PEOU->AT, PEOU->PU, AT->IN	6893
Venkaesh & Davis, 1996						×					×	SE->PEOU	5562
Davis et., al. 1989	×	×						×			×	PU&PEOU->AT, AT-> IN	35772
Hill et., al., 1987						×					×	SE->IN	1486
Davis & Baggozzi, 1992	×	×									×	PU&PEOU->IN	9117
Bhattacherjee & Sanford, 2006	×			×							×	JR->PU, PU->IN	1658
Kim, 2008	×	×		×							×	PU&PEOU->IN, JR->PU	408
Venkatesh et., al. 2012			×								×	CBP->IN	12199
Kleijnen et., al., 2004	×	×	×					×			×	AT->IN, PU->IN, PEOU->AT	771
Agarwal & Prasad, 1998		×								×	×	PEOU-> IN, PI->PEOU&IN	4513
Parveen & Sulaiman, 2008	×	×					×			×	×	PU->IN, PEOU->PU, COT->PU&PEOU, PI-> PU&PEOU	124
Shin, 2009	×	×	×					×			×	PU&PEOU->AT, AT-> IN, CBP->IN	202
Karjaluoto et., al., 2014	×	×						×		×	×	PU&PEOU->AT, AT-> IN, PI->PU&PEOU	67
Total	11	11	2	4	2	3	1	5	2	3	14		

(b)

Hypothesis from the literatures	Reference
SN will have a positive direct effect on PU, IN	Venkaesh & Davis, 2000
SN will have an effect on PU, IN	Venkatesh & Bala, 2008
PI positively related to PU, PEOU	Karjaluoto et., al., 2014
PI moderates the relationship between PEOU and IN	Agarwal & Prasad, 1998
PI will have a significant effect on PU, PEOU	Parveen & Sulaiman, 2008
Perceived cost level has a significant influence in IN	Shin, 2009
Perceived cost have a direct negative effect on AT	Kleijnen et., al., 2004
JR will have a positive effect on PU	Venkaesh & Davis, 2000
JR has a positive moderating effect on PU	Bhattacherjee & Sanford, 2006
JR moderates the effect of PU	Kim, 2008
JR will have an effect on PU	Venkatesh & Bala, 2008
RD will have a positive effect on PU	Venkaesh & Davis, 2000
RD will have an effect on PU	Venkatesh & Bala, 2008
SE will strongly determine PEOU	Venkaesh & Davis, 1996
SE will have an effect on PEOU	Venkatesh & Bala, 2008
COT will have a significant effect on PU, PEOU	Parveen & Sulaiman, 2008

Model Construct

This CF used TAM as a theoretical foundation to build a model for understanding Bio-QR code acceptance for the EBN traceability system. We began conceptualizing after the introduction of variables in TAM 1. The reasons for selecting the TAM have already been stated. The modeling began with four factors: two independent variables, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), one mediator (Attitude - AT), and one dependent variable (Intention - IN). We then included a Social Influence factor called the Subjective Norm (SN) in our model because we agreed with TAM 2's concept of increasing SN, a variable that affects PU and IN (Venkatesh & Bala, 2008; Venkatesh & Davis, 2000), but we did not exclude AT. Because our future research samples are swiftlet-house farmers, we kept AT based on the concept of TRA to support the presence of AT variables in the model. Farmers are self-employed individuals who do not work for a corporation. Therefore, when the target group is individualistic rather than under the control of organizations, we use the TRA as a supporting theory to construct this CF, which is better suited to understanding individual behavior than TAM, so that the conceptual framework is more appropriate for the target group we want to study. Following that, we introduced a new factor called Personal Innovativeness (PI). The swiftlet-house farmers are individuals with an entrepreneurial spirit, and their decision to accept the new traceability system is also for business purposes; thus, in the DOI theory, we refer to Rogers' concept of adopter characteristics (Rogers, 1983). Furthermore, according to Hagedoorn, a Schumpeter entrepreneur is "a motivated economic agent who appears to be never satisfied by results based on existing innovations but who keeps searching for new opportunities" (Hagedoorn, 1996). The preceding statement is consistent with the DOI theory, which describes the characteristics of people who are more willing to accept change than the average person in society (Rogers, 1983), and which we refer to as Personal Innovativeness (PI) characteristics. We agree with Cabanillas and Montoro-Rios' hypothesis that PI influences IN (Cabanillas, de Luna, & Montoro-Rios, 2015) and with Parveen & Sulaiman and Karjaluoto et., al's assumptions that PI influences PU (Karjaluoto, Tollinen, Pirttiniemi, & Jayawardhena, 2014; Parveen & Suliman, 2008).

We added three variables to improve understanding of the PU: two determinants associated with TAM 2, which we called innovation characteristics: Job Relevance (JR) and Result Demonstrability (RD), and one variable from the study of behavioral decision theory, the Cost & Benefit Paradigm (CBP). JR refers to people's perceptions of technology that can be utilized in their jobs (Venkatesh & Davis, 2000). Thus, those who recognize the need for innovation in their workplace are more likely to implement it than those who do not (Barton & Deschamps, 1988; Bhattacherjee & Sanford, 2006). However, regardless of how well the system supports your work, it may become a failed system if no users accept it. People will not perceive any benefit from the system unless the results of its application can be demonstrated (Moore & Benbasat, 1991; Venkatesh & Davis, 2000). The outcomes provide the best presentation to decision-makers on how well the system can function and how to benefit from its implementation. Thus, the demonstration of results determines whether the system is valuable enough to accept, and from what has been described above, we call this factor RD. JR and RD are added to our model as antecedents to PU, as in TAM 2. Afterward, we referred to what Davis mentioned about the Cost & Benefit Paradigm as "people's choice among various decision-making strategies" in his early work on TAM development and linked it to PU and PEOU (Davis, 1989). Later, in the work of Venkatesh et al., a variable known as "Price Value" was introduced into his study of the Behavioral Intention (Venkatesh et al., 2012). The interest of this variant is that it explains the case of employees in the organizational environment as decision-makers in deciding whether to accept and implement the system. These users are not responsible for the monetary cost when deciding to adopt the new technology, unlike general users who must consider the cost of implementing the technology when deciding to apply the

new system. Because the test units in this CF development are swiftlet-house farmers who are independent and not under the control of the organization, opinions about Cost/Benefit analysis cannot be avoided when adopting the technology because adoption implies investment in the new system for business use. We incorporated this factor into our conceptual framework and extended the meaning of cost/benefit beyond the financial cost. We agreed with Mitchell and Beach's study and included our translation of costs, such as time and effort, as additional meanings (Mitchell & Beach, 1978). To correspond with cost, we broadened the scope of benefits' meanings to include things that decision-makers value, such as increased opportunity or improved brand image, etc. These are broader translations than just financial meaning. As a result, we are not naming the factor after Venkatesh et., al, but rather after the Cost & Benefit Paradigm (CBP), which has a broader meaning. Furthermore, we disagree with Venkatesh et., al.'s hypothesis that CBP directly influences IN (Venkatesh et al., 2012). We determined that CBP influences PU because users perceive the usefulness of implementing the system when the benefit from usage outweighs the cost.

To clarify our understanding of PEOU, we added two variables: one anchor (Self-efficacy - SE) and one innovation characteristic (Complexity of Technology - COT). Self-efficacy (SE) is a variable that affects PEOU, similar to the Computer Self-efficacy variable from TAM 3. However, we did not limit ourselves to computer anchors. Self-efficacy (SE) is the awareness of one's own ability to operate automation machinery, such as IT technology, to complete a specific task (Venkatesh et al., 2003). It entails assessing how well a person will handle future situations (Bandura, 1982; Davis, 1989). People avoid tasks that they believe are beyond their capabilities. They will, on the other hand, respond to activities that are deemed manageable (Bandura, 1977). SE also defines how much effort people will put in and how long they can endure when confronted with obstacles, unpleasant experiences, or hardships (Bandura, 1982). Therefore, it is linked to Perceptual Ease of Use (PEOU). The concept of Complexity of Technology (COT) is derived from "Complexity," one of the innovation characteristics in DOI theory. While PEOU is positively related to IN (Davis, 1989), complexity has a negative impact on the adoption of innovation (Tornatzky & Klein, 1982). It may not be easy to use if it is rated as complex. In contrast, if it is not complicated, it is simple to use. As a result, COT and PEOU are inversely related. If there is a "Complexity" variable in some studies, there will be no PEOU in those behavioral studies (Thompson, Higgins, & Howell, 1991). However, a study by Parveen and Sulaiman, discovered a link between COT and PEOU (Parveen & Suliman, 2008). As a result, we chose the COT as an antecedent to the PEOU in our conceptual framework. Because we intend to conduct interviews using this conceptual framework in our future research. We included this variable in the conceptual framework because we believe that selecting comprehensive factors will help clarify our interpretation and classification of keywords.

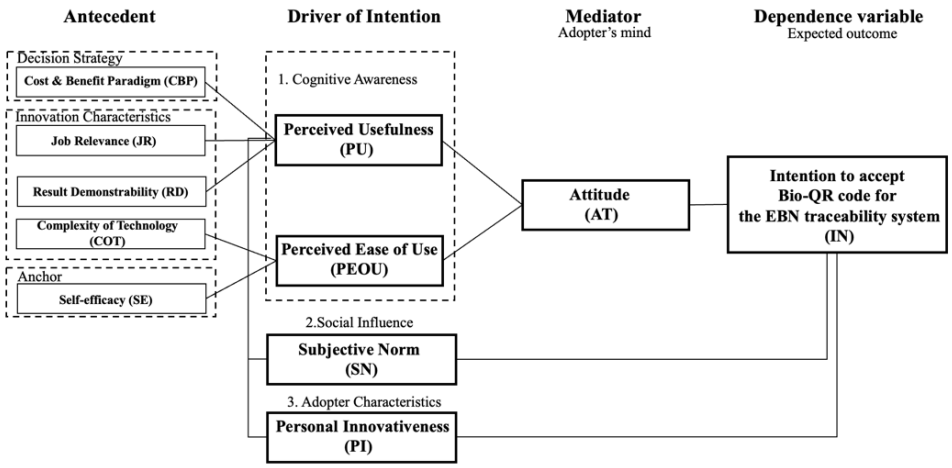

Figure 2 Conceptual framework to understand swiftlet-house farmers' acceptance of Bio-QR code for the EBN traceability system.

CONCLUSION

According to the new regulations issued by the Chinese government, all legal imports of EBN must use traceability systems as the new EBN quality standard (Sukantapong, 2019). After more than ten years, it was discovered that fewer than 60 exporters from the three major exporting countries (Indonesia, Malaysia, and Thailand) qualify as legal EBN exporters in this market (CAIQ, 2020). Due to this new food safety policy, Thai's EBN industry has suffered from being unable to export to China directly. To address this problem, we intended to create a Bio-QR code for the EBN traceability system. We hope the new system is widely accepted by target users, which will help promote Thai's EBN quality standard.

The goal of this paper is to propose a conceptual framework for understanding swiftlet-house farmers' acceptance of the Bio-QR code for the EBN traceability system. Swiftlet-house farmers are our direct users of the system and the first parties in the EBN supply chain responsible for bringing raw bird's nest material into the EBN industry's supply chain. TAM was used as a ground theory for developing our conceptual framework. This framework (Figure 2) includes five factors (PU, PEOU, AT, SN, and PI) to determine the intent (IN) to perform the behavior. The adoption of our new traceability system is our expected behavior. Moreover, three determinants (CBP, JR, and RD) were used to identify PU, and two variants (SE and COT) served as antecedents of PEOU.

During the development of our CF, we noticed a limitation of this work: there were few papers in the same field as ours (such as agriculture or farmers, entrepreneur, food traceability, and QR code) that used additional variables excluded from TAM's standard model, particularly the factors we are interested in from other theories (Table 2). As a result, we must cite papers outside the scope of our topic by selecting appropriate articles using the screening process described in the methodology above.

Table 2 Summary of literature reviews from the papers in the same area of our study with the highest citation using keywords such as TAM and agriculture or farmers, TAM and entrepreneur, TAM in food traceability, and TAM and QR code.

Topics	Authors	Factors Influencing Intention to Perform Behaviors										Relevant Hypothesis	Citation	# of Paper
		PU	PEOU	CBP	JR	RD	SE	COT	AT	SN	PI	IN			
TAM & Agriculture (Farmer)	Adnan et., al., 2017	×	×						×	×		×	PU&PEOU->AT, AT->IN, SN->IN	50	
	Caffaro et., al., 2020	×	×									×	PU&PEOU->IN	48	
	Rezaei et., al., 2020	×	×			×	×		×	×		×	PU&PEOU->AT, PEOU->PU, AT->IN, Social Influence->PU&IN, RD->PU, SE->PU&PEOU	46	
	Kabbiri et., al., 2018	×	×									×	PU->IN, PEOU->PU, PEOU->IN	42	
	Sharifzadeh et., al., 2017	×	×				×					×	PU&PEOU->IN, PEOU->PU, SE->IN	42	87
	Jimenez et., al., 2020	×	×						×			×	PU->IN, PEOU->PU, PEOU->AT	40	
	Zhou & Abdullai, 2017	×	×	×					×			×	PU&PEOU->AT, PEOU->PU, Cost Tolerance->PU&PEOU	37	
	Nasperi et., al., 2017	×	×						×	×		×	PU&PEOU->AT, AT->IN, SN->IN, SN->PU&PEOU	32	
	Chaveesuk et., al., 2020	×	×				×			×		×	PU&PEOU->IN, SE->PEOU, SN(Social Influence)->PEOU	20	
TAM & Entrepreneur	Rahman et., al., 2017	×	×								×		PI->PU&PEOU	53	48
	Ndubisi et., al., 2005	×	×								×	×	PI->PU&PEOU&IN	43	
	Zarmeskizabih et., al., 2016	×	×		×	×				×		×	PU&PEOU->IN, PEOU->PU, SN->PU&IN, JR->PU, RD->PU	18	
	Salim et., al., 2021	×	×						×			×	PU->AT, PEOU->AT, PEOU->AT, AT->IN	13	
	Subaramo & Lee, 2018	×	×	×						×			PU&PEOU&Resources F&Social Influence->Resistance Adoption	11	
TAM & Food Traceability	Kim & Woo, 2016	×	×						×			×	PU&PEOU->AT, PEOU_>PU, AT->IN	114	
	Bugnosmee & Piyoorat, 2016	×								×		×	PU->IN, SN->PU&IN	7	16
	Kumar et., al., 2022	×	×						×			×	PU&PEOU->AT, PEOU->PU, AT->IN	7	
	Tseng et., al., 2022	×	×									×	PU&PEOU->IN, PEOU->PU	3	
TAM & QR Code	Shin et., al., 2012	×	×						×	×		×	PU&PEOU->AT, AT->IN, SN->Behavior	229	
	Cabanillas et., al., 2015	×	×						×		×	×	PU&PEOU->AT, AT->IN, PI->PU&PEOU&IN, SN->AT&IN	94	
	Higgins et., al., 2014	×	×						×			×	PU&PEOU->AT, AT->IN	57	22
	Wijitsorn et., al., 2021	×	×								×	×	PU&PEOU->IN, SN->IN, PI->IN	5	
	Tolker et., al., 2022	×	×							×		×	PU&PEOU->IN, PEOU->PU, SN->PU&IN	3	
	Total	18	17	2	1	1	4		10	7	3	18			

The CF obtained from this study will be used in future research to help us develop a better traceability system than the existing ones. Traceability systems protect customers from the risks of food safety issues and assist the Thai edible bird's nest industry in reviving the crisis in the international trade arena. We hope our new system will be developed as planned and extensively accepted by the target users; therefore, customers and businesses will earn the full benefits we expect.

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