

Intention to Purchase Traceable Meat: The Impacts of Perceived Information Asymmetry, Informativeness, Usefulness, and Norm

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ABSTRACT

Manuscript type: Research paper

Research aims: The purpose of this study is to develop a causal model for intention to purchase traceable meat by positing perceived information asymmetry as the primary antecedent.

Design/Methodology/Approach: A survey of 450 Thai participants was conducted. Data were analysed with structural equation modeling (SEM).

Research findings: Results reveal that perceived information asymmetry together with perceived informativeness, subjective norm and perceived usefulness are significant determinants of consumers' intention to purchase traceable meat. Results also show that the mechanism involving the two information-related constructs (perceived information asymmetry and perceived informativeness) are linked in this set of relationship where perceived information asymmetry acts as the primary motivation.

Theoretical contributions/ Originality: This research is the first to propose that perceived information asymmetry and perceived informativeness can be incorporated into the technology acceptance model (TAM) and the theory of reasoned action (TRA).

Practitioner/ Policy implications: Based on the study results, marketers can design appropriate marketing plans so as to communicate the benefits of the traceability system.

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Research limitations/Implications: The replication of this research model with different sample or other products is recommended to increase the generalisability of results.

Keyword: Meat, Perceived Information Asymmetry, Perceived Informativeness, Traceability

JEL Classification: M31

1. Introduction

Since the emergence of mad cow disease (BSE), dioxin contamination, and radiation contamination, consumers have become more concerned with meat safety (Buhr, 2003). More consumers are beginning to question the sources and production detail of the meat they consume. To do this, meat consumers look for information to help them evaluate meat safety and quality with more accuracy. However, this is a difficult task because of the information gap or asymmetry in the quality of meat products existing between the seller and the consumer (Hobbs, 2004). In other words, the seller may have more information about the true quality and characteristics of the product than the consumer (Chen & Huang, 2013). This information asymmetry may thus reduce consumers' purchasing intentions (Pavlou, Liang, & Xue, 2007). If consumers can detect or examine the characteristics of food prior to purchase, information asymmetry may decrease or even cease to exist (Choe, Park, Chung, & Moon, 2009). In response to this concern, an information technology called "traceability system" has been implemented within the meat supply chain for more effective handling of meat safety and quality issues (Hobbs, 2004). The traceability system was initially established in Europe and it subsequently came to be used by many other countries including those in Asia (Wu, Xu, & Gao, 2011).

Meat traceability system aims at ensuring that consumers receive safe meat products. In addition, the traceability system responds to consumers' right to information concerning product origin (Vaz & Vaz, 2014). This is because meat information encompassing various aspects such as farming, processing, packing, distribution, transportation, and sales processes were previously only accessible to sellers. Today, such information can be more easily retrieved by consumers. As an example, the meat data may be recorded using a two-dimensional barcode called QR code labels (Qian, Yang, Wu, Zhao, Fan, & Xing, 2012). A smart phone or a tablet can scan the barcode labels thereby, allowing consumers to have quick access to relevant websites and learn more about the origin of the meat products from beginning until the

products reach the retailer's shelf. Consequently, meat consumers are capable of making a better informed decision on the safety and quality of their meat purchases (Hobbs, Bailey, Dickinson, & Haghiri, 2005) via the information provided by the meat traceability system.

Numerous studies have attempted to investigate the effects of traceable meat on consumer behaviour in various areas such as types of preferred meat traceability information (Dickinson & Bailey, 2002), meat traceability and information asymmetry (Hobbs, 2004), consumer willingness to pay for traceable meat (Dickinson & Bailey, 2005), food traceability, consumer uncertainty and purchase intention (Choe et al., 2009; Chen & Huang, 2013), and consumer intention to use food traceability system (Tsai, Hong, Yeh, & Wu, 2014). Few studies, however, have tried to specifically develop a causal model of consumers' intention to purchase traceable meat with regard to information asymmetry as the primary antecedent (or exogenous variable). It is worthy to note that research in this topic remains scarce although information asymmetry could be fundamental to consumers' concerns (Hobbs & Plunkett, 1999). As an example, evidence from consumer research suggests that there is a possible relationship between traceability system and low perceived information asymmetry in general foods (Choe et al., 2009) and fast foods (Chen & Huang, 2013). Nonetheless, the void in the literature substantiated by preliminary evidence gathered from previous research has inevitably, raised the following fundamental research questions in the present study: Does the perceived information asymmetry act as the primary antecedent of consumer's intention to purchase traceable meat? If so, how does that happen?

The current study focuses on Thailand as a research site because it is a country where meat traceability system, as a potential marketing tool targeted at meat consumers, is still at its infancy stage. In addition, Thailand is part of the ASEAN Economic Community (AEC). Thus, the results of this study could be beneficial for importers of meat products to Thailand and other ASEAN countries. At present, some leading Thai companies which operate a comprehensive meat business have developed the traceability system so as to standardise their meat quality and safety productions. It is observed that at several supermarkets in major cities in Thailand, a traceability machine is provided at the point of purchase for consumers to access the meat details. Further, consumers are also able to scan a QR code on meat packages so as to quickly access meat traceability information via their smart phones. It is unclear if Thai consumers may be able to accept meat traceability system for meat, and so be willing to use it (Piemkhoontham & Ruenrom, 2010). Thus, specific reasons for this positive feedback need to be further investigated.

The traceability system is basically an information technology. In the current study, the technology acceptance model (TAM) is adopted as a basic model for examining the impact of perceived information asymmetry, informativeness, usefulness and norm on intention to purchase traceable meat. To further develop a causal model for intention to purchase traceable meat, the perceived usefulness construct from TAM (Davis, Bagozzi, & Warshaw, 1989) and the subjective norm construct from the theory of reasoned action (TRA) have been included into the current study. To further contribute to the technology acceptance literature, perceived information asymmetry which is found in the principal-agent perspective of information technology (Pavlou et al., 2007; Choe et al., 2009) was also incorporated into the current model. This variable is selected based on the distinctive feature of traceability technology which focuses on information search process. Consumers who perceive a higher degree of information asymmetry are more likely to need more information related to their food. Hence, they would possess a stronger need to systematically search for information concerning the meat production and distribution prior to their purchase decision (Hobbs, 2004; Chen & Huang, 2013). The informativeness (more information) offered by the traceability system is thus expected to be helpful in improving consumers' purchase decision (van Rijswijk & Frewer, 2008).

In this light, this study is expected to contribute to TAM, TRA and the food marketing literature by documenting the role of perceived information asymmetry and that of perceived informativeness as antecedents of the intention to purchase traceable meat. Furthermore, the findings of this study will provide several managerial implications regarding the use of traceability system as a marketing tool.

The rest of this paper is organised as follows. Section 2 reviews the relevant literature and describes how the research model was developed. Section 3 explains the research methods and section 4 reports the findings. Section 5 discusses the theoretical and managerial implications of this study. Finally, section 6 provides the limitations and suggestions for future research, and section 7 concludes the study.

2. Literature Review and Hypothesis Development

2.1 Technology Acceptance Model (TAM)

The technology acceptance model (TAM) was adapted by Davis et al. (1989) from the theory of reasoned action (TRA) (Fishbein & Ajzen,

1975). In comparison to TRA, TAM is particularly suited for explaining behavioural intention in a technology context (Davis et al., 1989). For example, the TAM was employed to predict the acceptance of e-shopping (Ha & Stoel, 2009), e-government learning (Shyu & Huang, 2011), and mobile payment services (Schierz, Schilke, & Wirtz, 2010).

Two predicting variables in the TAM are perceived usefulness (PU) and perceived ease of use (PEOU). PU reflects the degree an individual believes that using a particular technology would enhance his/her performance (Davis, 1989). In contrast, PEOU refers to the extent a person believes that using a particular system would be free of effort (Davis, 1989). From these two variables, PU has been identified as a better predictor of intention to use. On its own, the PEOU may not reflect an intrinsic quality of a product (e.g., Gefen & Straub, 2000). Lee, Kozar, and Larsen (2003, p.759) assert that "perceived ease of use is found to be an unstable measure in predicting intention". While PU has consistently appeared to be a stronger determinant of intention, the impact of PEOU has not been observed in numerous studies (e.g., Lee et al., 2003). In the meat traceability context, consumers can use the traceability system by simply using their cell phones to read the QR code which provides a lot of information. This implies that the traceability system is easy to use. Subramanian (1994) suggests that when the system is inherently easy to use, PEOU is likely to have less or no impact on the technology acceptance. Similarly, as the meat traceability system in the present study is easy to use, PEOU is excluded from the current model. The focus is on PU because consumers tend to voluntarily use a system with a useful functionality (Davis, 1989). Keil, Beranek, and Konsynski (1995, p.89) had in fact, criticised the overall impact of PEOU in TAM saying, "no amount of PEOU will compensate for low usefulness". Therefore, PU is the TAM-drawn variable focused in the current study.

Some limitations detected in the TAM had led Venkatesh and Davis (2000) to develop TAM2 as a means to understand how users perceive the usefulness of technology. Thus, TAM2 was extended to include one of the factors in social influence processes, subjective norm, an important determinant of intention used in the original construct of TRA. It was included for the purpose of increasing the ability to reflect the extent a person would perceive an element to be the most important factor that would make the person behave and perform in a particular way (Fishbein & Ajzen 1975). Subjective norm is one of the important influencers of consumers' decisions (Melnyk, van Herpen, & van Trijp, 2010) because consumers are inclined towards complying with the views

of such significant referents like family members, friends or colleagues in order to meet their expectations and earn their approval (Chen, Yen, & Hwang, 2012). Therefore, the present study seeks to assess the role of subjective norm in traceable meat purchase.

It is also worthy to note that despite ample research in technology being conducted, few had examined the role of information-related variables. This further undermines the fact that information could play a key role in technology adoption. The current study aims to fill this void by investigating the role of perceived information asymmetry on technology acceptance.

2.2 The Principal-Agent Perspective and Information Asymmetry

The principal-agent perspective, built upon the agency theory, has been extended to markets of imperfect information (Akerlof, 1970) where the principal and the agent refer to the buyer and the seller, respectively. The principal-agent perspective suggests that information problems in terms of hidden information or information asymmetry could be alleviated through proper information technology (Pavlou et al., 2007).

Information asymmetry refers to an instance where the buyer has the perception that the seller or firm has a greater quantity or quality of information about a product than the consumer (Pavlou et al., 2007). It often arises in a market where a firm may behave immorally by, for example, manipulating some of the information regarding the safety of products (Lin, Tsai, Joe, & Chiu, 2013). This lack of information may cause the consumer or buyer to be in a disadvantaged situation because the buyer cannot easily distinguish high quality products from low quality ones (Wilson, 1980). In this situation, sufficient information about the seller and the product is necessary. Sources of information such as websites provide useful information where the buyer can learn more about the seller's practices and product characteristics thereby, decreasing the level of perceived information asymmetry (Pavlou et al., 2007).

In the meat sector, the negative impact of perceived information asymmetry could cause a market failure. Meat traceability could thus, be a source of information that enables consumers who perceive high information asymmetry to access more information about food safety and quality attributes. This can increase consumers' level of perceived informativeness of the traceability system (Hobbs, 2004).

In the current study, perceived informativeness refers to the extent the traceability system can provide buyers with resourceful and helpful

information (Choe et al., 2009). The informativeness of traceability is a perceptual construct (Chakraborty, Lala, & Warren, 2002) which can differ from the actual or objective number of types of informational cues provided by the seller. Providing a detailed product information to consumers ensure that they receive adequate information for purchase decision making (Aboulnasr, 2006). Such information acquired from the seller may also signal the seller’s professionalism and trustworthiness. In return, consumers become more relieved as they may then form the impression that a seller with traceability system is less likely to take advantage of consumers through deception in product quality or shortchanging consumers in products (Pavlou et al., 2007).

2.3 Research Model and Hypotheses Development

The research model (Figure 1) is composed of the hypothesised relationships among five variables: perceived information asymmetry, perceived informativeness, subjective norm, perceived usefulness, and purchase intention. As explained earlier, perceived information asymmetry reflects a buyer’s perception that the seller or firm has a greater quantity or quality of information about the product (Pavlou et al., 2007). Perceived informativeness reflects the degree to which the traceability system can offer a buyer with helpful information (Chen

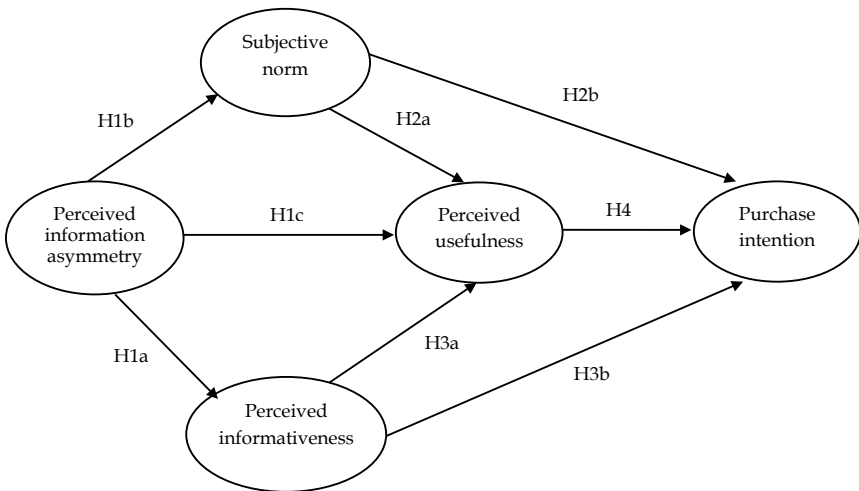


Figure 1: Initial Research Model

& Huang, 2013). Subjective norm refers to a buyer's perceived social influence or pressure to use a traceability system (Kim & Chung, 2011). Perceived usefulness refers to the extent a buyer believes that using a traceability system will enhance buyer's performance in meat purchase decision (Davis, 1989). Finally, purchase intention reflects the likelihood in which a buyer will purchase traceable meat in the future (Choe et al., 2009).

2.3.1 *The influence of perceived information asymmetry on perceived informativeness, subjective norm, and perceived usefulness of meat traceability*

A number of studies (e.g., McCluskey, 2000; Hobbs, 2004; Loureiro & Umberger, 2007; Ortega, Wang, Wu, & Olynk, 2011) show that information asymmetry may cause consumers' concern for food safety. To overcome this, the traceability system, as a tool that can be used to handle perceived information asymmetry, is developed. Compared to traditional food labels which may provide insufficient product information due to space constraints, traceability with internet-based information systems is more capable of improving information exchange, providing greater quality control, and reducing opportunism of recording misinformation (Hobbs, 2004). Similarly, Buhr (2003) indicates that the primary purpose of traceability is to overcome the perceived information asymmetry between the seller and the consumer. In this sense, the utility of traceability system is to provide consumers with food quality and safety information, especially regarding credibility, which is currently lacking in the food market (Wu et al., 2011).

The present study focuses on the influence of information asymmetry as the primary antecedent for consumers' purchase intention of traceable meat for two reasons. First, some research (e.g., Hobbs, 2004; Ortega et al., 2011; Resende-Filho & Hurley, 2012) have employed economics models to investigate the relationship between traceability and information asymmetry. The results of these studies, however, appear to focus on the implications for sellers' or the government's development of the traceability system. They have not attempted to understand why or how consumers develop positive reactions toward meat traceability for marketing communication purposes. Therefore, the present study aims to approach the role of perceived information asymmetry from the consumers' view so as to gain insights which would be meaningful for managerial implications in using traceability as a potential marketing tool oriented towards consumers.

The present study also seeks to offer an alternative view of the relationship between perceived information asymmetry and perceived informativeness. Focusing on current users, Choe et al.'s (2009) study indicates that those with a higher degree of informativeness are more likely to have less information asymmetry. In this sense, their study suggests informativeness as an independent variable while information asymmetry as a dependent variable.

This study, however, offers an alternative perspective. It recommends that for consumers who had never used the traceability system before, the possible relationships between these two information-related variables may be reversed. Specifically, this study proposes that perceived information asymmetry can positively influence perceived informativeness. In other words, information asymmetry will act as an independent variable while informativeness acts as a dependent variable. In this study, it is expected that, for purchase intention to occur, the actual primary motivation for using information technology is likely to stem from consumers' concern for information asymmetry. This concern could further motivate or stimulate consumers' need to employ technology to search for more information, and where possible, to gain as much information as the seller does. The outcome will result in the perceived informativeness of that technology. In other words, when consumers perceive a high level of information asymmetry, they may be ready to engage in more active information search to narrow the gap (Verbeke, 2005). Subsequently, with a lot of information provided by the traceability system, consumers will perceive the traceability system as being informative.

H_{1a}: Perceived information asymmetry in traceable meat will positively influence perceived informativeness of meat traceability system.

Under the condition of information asymmetry, consumers may increasingly be motivated to engage more with resourceful information sharing such as social network. Likewise, they also tend to comply with social influence (Stefanone, Hurley, Egnoto, & Covert, 2015). In the meat traceability system context, Mora and Menozzi (2008) argue that subjective norm from such key referents like family and partner is expected to have a greater influence. This may be compounded when consumers do not have sufficient information for meat purchase decision. In this light, information asymmetry is expected to increase the role of subjective norm. In the current study, subjective norm reflects

the degree to which key referents believe that they (consumers) should use the traceability system in meat purchase decisions.

H_{1b}: Perceived information asymmetry in traceable meat will positively influence the role of subjective norm in traceable meat purchase.

Informativeness of agro-products' traceability system could be related to information asymmetry in consumers' perception (Choe et al., 2009). Risks or threats to consumers' well-being, especially those related to food quality or safety, could lead to information need arousals, thus active information search (Verbeke, 2005). At the initial stage of the meat purchase decision, consumers may perceive information asymmetry. Subsequently, they may recognise that the meat traceability system can provide more information than traditional meat labels. Moreover, the meat traceability system may provide information not previously available to general consumers (Loureiro & Umberger, 2007). As a consequence, their perception of informativeness of this information technology is likely to be high. This study thus, proposes that there is a positive relationship between perceived information asymmetry and perceived informativeness of meat traceability system. As the consumers perceive a higher level of information asymmetry, they should recognise to a higher extent, that the traceability system could provide a lot more information than they could expect. Consequently, a higher level of perceived information asymmetry is expected to lead to a higher level of perceived informativeness.

Another important issue relatively less discussed is the possible connection between information-related variables and perceived usefulness of a technology. Consumers' use of technology to access more information may also lead to consumers' perceived usefulness of that technology. This explains why the present study is attempting to associate information-related variables with perceived usefulness, the main variable in TAM. Traceability system seems to be a useful tool when consumers fall into a situation of information asymmetry (Hobbs, 2004). The traceability system can help to improve the quality of their decision-making. Its tangible usefulness offers access to the seller's website via a smart phone to track product sources thus, ensuring meat safety prior to purchase. When full information is timely and provided to consumers, the perception of usefulness of the traceability system is enhanced (Tsai et al., 2014).

H_{1c}: Perceived information asymmetry in traceable meat will positively influence perceived usefulness of meat traceability system.

2.3.2 *The influence of subjective norm on perceived usefulness and intention to purchase traceable meat*

In the model, TRA proposes that direct relationship between subjective norm and intention is based on compliance but TAM2 hypothesises that subjective norm has an indirect influence on intention through perceived usefulness based on internalisation. The aim is to detect if the recommendation of the usefulness of a meat traceability system made by family members/friends may influence an individual to believe its actual usefulness thereby, developing an intention to use it. This phenomenon is referred to as the internalisation effect, which is different from the compliance effect where a person may not actually believe that the system is useful (Venkatesh & Davis, 2000). In this sense, the opinions of important referents could form the basis for a person to feel the benefits of technology (Yi, Jackson, Park, & Probst, 2006).

According to the TRA, the reason one switches from subjective norm to direct path is to create the intention for individuals to be able to make a choice to perform a certain behaviour even if these individuals are themselves not favorable of the behaviour or its consequences. If important referents think that they should, these individuals would be sufficiently motivated to comply with the opinions of those important referents (Fishbein & Ajzen, 1975). Mora and Menozzi (2008) find this in their study on consumers' intention to purchase traceable food. Their results reveal that consumers who have a stronger intention to purchase traceable meat are in the well-disposed group (consumers who look for information and are favourably disposed to traceability). Their behavioural intention and attitude are more positively influenced by third parties, especially family members, doctors or specialists.

The roles of subjective norm in explaining technology acceptance have been uncovered in various contexts such as healthcare professionals' acceptance of PDA or personal digital assistant (Yi et al., 2006) and consumers' acceptance of airline e-commerce websites (Kim, Kim, & Shin, 2009). The extended models used by Yi et al. (2006) and Kim et al. (2009) confirm a significant and positive direct effect of subjective norm on both perceived usefulness and intention.

As a consequence, the model used in the current study assesses the role of subjective norm as an antecedent of perceived usefulness and intention. This is because subjective norm represents each individual's

motivation to act according to the opinions of people who are relevant to him/her. Furthermore, in marketing research, the focal behavioural intention of interest is most often studied in terms of intention to purchase which represents consumers' plan or willingness to purchase or adopt a product in the future. The present study, therefore, focuses on intention to purchase as the ultimate dependent variable in the model.

H_{2a}: Subjective norm in traceable meat purchase will positively influence perceived usefulness of meat traceability system.

H_{2b}: Subjective norm in traceable meat purchase will positively influence intention to purchase traceable meat.

2.3.3 *The influence of perceived informativeness on perceived usefulness and intention to purchase traceable meat*

The influence of perceived informativeness is particularly critical for food products in contexts where consumers lack the capability to accurately evaluate product safety. This is because a number of credence attributes or characteristics of meat quality are difficult for the consumers to evaluate, for example, general food safety (e.g., microbial infections, dioxins, and BSE) and residue-related quality (e.g., hormone residues and antibiotics) (Loureiro & Umberger, 2007). With the traceability system, consumers are given the support to detect and have informed product assessment or to get a real feel of the quality and performance of the meat (Choe et al., 2009). For this reason, the meat traceability system can be regarded as an informational cue of meat quality (Krystallis, Chryssochoidis, & Scholderer, 2007).

From the literature review noted, the usefulness of the traceability system is deemed to be more informative as it offers consumers more information on meat product with the possibility of recalling any imperfect product (van Rijswijk & Frewer, 2008). Information offered by the traceability system is thus, considered valuable and helpful for consumers' decision making to purchase (Mora & Menozzi, 2008). In other words, a higher degree of perceptive informativeness of meat traceability is more likely to lead to a higher degree of perceived benefit of this technology. Based on this discussion, the present study proposes the following hypotheses:

H_{3a}: Perceived informativeness of meat traceability system will positively influence perceived usefulness of meat traceability system.

H_{3b}: Perceived informativeness of meat traceability system will positively influence intention to purchase traceable meat system.

2.3.4 *The influence of perceived usefulness on intention to purchase traceable meat*

To understand consumers' intention to use a product, marketers need to measure the perceived usefulness that the product possesses. Perceived usefulness is one of the main TAM constructs to predict intention (Davis et al., 1989). For example, the perceived usefulness of websites can predict online purchase intention (e.g., Ha & Stoel, 2009). In the present study, perceived usefulness of meat traceability system reflects consumers' belief that traceability will augment their decision performance in buying meat products (Choe et al., 2009). The intention to use this technology is, therefore, dependent on the degree of consumers believing that this technology will increase the effectiveness and efficiency of their purchase decision. In this sense, the higher level of perceived usefulness of traceability technology will encourage consumers' intention to use or adopt this technology.

Numerous studies looking at meat traceability system have attempted to investigate consumers' response to the system in terms of their purchase intention (e.g., Choe et al., 2009) and willingness to buy (e.g., Zhao, Qiao, & Chen, 2010; Wu et al., 2011). These studies find that the advantages provided by the meat traceability system may positively influence consumers' intention to purchase traceable meat. As a result, the current study proposes the following hypothesis:

H₄: Perceived usefulness of meat traceability system will positively influence intention to purchase traceable meat.

3. Methodology

3.1 *Sample and Procedure*

This survey was conducted with undergraduate business students in the Northeastern region of Thailand. The student samples may not be representative of a whole population as they are not necessarily the typical consumers in the natural settings. However, they represent future informed buyers. Further, they are likely to use information technology (e.g., smart phone and tablet) in making a purchase.

Four hundred and sixty (460) questionnaires in a paper-and-pencil format were distributed to participants in their classrooms

during regular class hours. The research participants were selected via judgmental sampling technique which includes the criteria of participants' interest and involvement with the product category used in the present study. Two screening questions (meat consumption and experience in meat purchase) were asked at the beginning of the self-administered questionnaire. Those who did not consume meat and had no experience in meat purchase were excluded. The participants were then informed of the research objective and a brief description of the survey was provided. They were subsequently requested to complete the measures of perceived information asymmetry, subjective norm, perceived usefulness, perceived informativeness, and purchase intention. Finally, they were asked to provide their personal data.

A total of 450 research participants provided the valid responses voluntarily. Table 1 presents the sample profiles. Seventy-seven (77) per cent of the respondents were females and 23 per cent were males. Fifty-six (56) per cent of the participants were between 21 and 30 years old. In total, 80 per cent had a monthly income of lower than USD285. On average, the research participants had a moderate level of meat product involvement (from a 5-point scale, means=3.88, SD=0.90) and meat product knowledge (means= 3.17, SD=0.69).

Table 1: Sample Profiles and Descriptive Statistics

Sample profiles	Descriptive statistics (N = 450)	
	N	Per cent
<i>Gender</i>		
Male	105	23
Female	345	77
<i>Age</i>		
<21 years	199	44
21-30 years	251	56
<i>Monthly income (USD)</i>		
<285	360	80
285-571	82	18
>571	8	2
	Mean	SD
Meat product involvement	3.88	0.90
Meat product knowledge	3.17	0.69

3.2 Measurement

The research model includes five constructs and each construct was measured with multiple items (see Appendix). All items were measured with a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Perceived information asymmetry was measured with four items adapted from Dunk (1993) and Choe et al. (2009). Three items of subjective norm and four items of perceived usefulness were adapted from Pavlou and Fygenson (2006). In the case of perceived informativeness and purchase intention, each was measured with three items adapted from Choe et al. (2009).

A confirmatory factor analysis (CFA) was conducted to examine the validity and reliability of the measurement model. Average variances extracted (AVE) and composite reliability (CR) were used as the criteria to measure convergent validity (Hair, Black, Babin, & Anderson, 2010). In addition, discriminant validity was measured by the square root of AVE of each construct and this should be more highly correlated with its own than the correlations between constructs (Fornell & Larcker, 1981). Next, structural equation modeling (SEM) was utilised to test the hypothesised model. Apart from the traditional chi-square used, this study also reported several model fit indices such as goodness of fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), normed fit index (NFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA). Satisfactory models should have an insignificant chi-square, with RMSEA less than 0.08. Moreover, GFI, AGFI, CFI, NFI, and TLI should be greater than 0.90 (Hair et al., 2010).

4. Results

4.1 Analysis of Measurement Model

The results in Table 2 display the standardised item loadings, the AVE and CR. All but one item loadings were larger than 0.6, and all loadings were highly significant. The CR varies from 0.81 to 0.87, satisfying the criteria of 0.70. In addition, the AVE varies from 0.52 to 0.65, thus, satisfying the criteria of 0.50 (Hair et al., 2010). As a result, the measurement model appears to have good reliability and convergent validity.

Table 2: Results of Confirmatory Factor Analysis (CFA)

Constructs	Items	Standardised Loading	t-value	AVE	CR
Perceived information asymmetry	ASYM1	0.75	a	0.53	0.82
	ASYM2	0.82	14.25		
	ASYM3	0.65	12.59		
	ASYM4	0.69	13.44		
Perceived informativeness	INFO1	0.78	a	0.58	0.83
	INFO2	0.80	14.90		
	INFO3	0.76	14.68		
Subjective norm	SN1	0.81	a	0.62	0.83
	SN2	0.86	15.57		
	SN3	0.69	14.30		
Perceived usefulness	PU1	0.78	a	0.52	0.81
	PU2	0.84	13.99		
	PU3	0.65	12.48		
	PU4	0.58	11.26		
Purchase intention	PI1	0.78	a	0.65	0.87
	PI2	0.89	18.06		
	PI3	0.82	17.56		

Note: ^a The corresponding parameter is fixed to a value of 1.00 in order to set the scale of measurement.

From Table 3, it can be observed that the means of the five constructs varied from 3.74 to 4.00 and their standard deviations vary from 0.58 to 0.70. Pearson’s correlation coefficients of the five constructs vary from 0.311 to 0.581 while the \sqrt{AVE} of each construct varies from 0.742 to 0.806. As the \sqrt{AVE} of each construct is greater than its correlation coefficients with other constructs, the measurement model therefore, appears to have decent discriminant validity.

Table 3: Means, Standard Deviations, the Square Root of AVE, and Construct Correlations

Constructs	Mean	S.D.	1	2	3	4	5
Perceived information asymmetry	3.81	0.59	0.742				
Perceived informativeness	3.86	0.66	0.442*	0.762			
Subjective norm	3.74	0.68	0.311*	0.402*	0.787		
Perceived usefulness	4.00	0.58	0.511*	0.581*	0.448*	0.742	
Purchase intention	3.85	0.70	0.361*	0.431*	0.446*	0.495*	0.806

Note: (a) * denotes significance at 1% level

(b) Square root of AVE shown as bold numbers along the diagonal.

4.2 Analysis of Structural Model

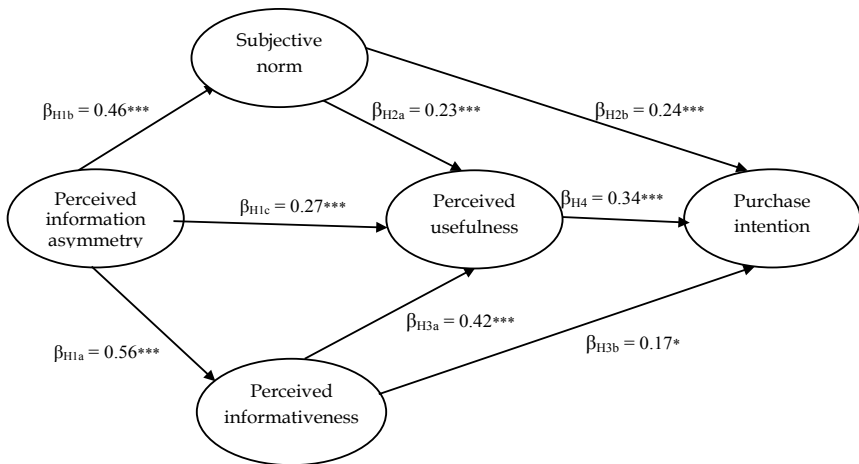
After the validity and the reliability of the measurement model were ascertained, the next step was to test the research hypotheses. SEM was employed to examine the theoretical model. The raw data of the observed variables retained from the CFA were used for the analysis, and the maximum likelihood method was employed. The results as displayed in Table 4 reveal that $\chi^2=122.067$, $df=100$, $\chi^2/df=1.221$, $p=0.066$, $GFI=0.969$, $AGFI=0.953$, $CFI=0.994$, $NFI=0.968$, $TLI=0.992$, and $RMSEA=0.022$. Since these fit indices have better values than those recommended by Hair et al. (2010) as indicated in the measurement section, there is thus, a model fit between the proposed model and the data.

Table 4: The Recommended and Actual Values of Fit Indices

Fit indices	p-value	c2/df	GFI	AGFI	CFI	NFI	TLI	RMSEA
Recommended value	> 0.05	< 3	> 0.90	> 0.90	> 0.90	> 0.90	> 0.90	< 0.08
Actual value	0.066	1.221	0.969	0.953	0.994	0.968	0.992	0.022

Note: Recommended values are suggested by Hair et al. (2010)

Figure 2 presents a summary of the structural model and hypothesis testing.



Note: *** and * denote significance at the 0.1% and 5% levels, respectively

Figure 2: Results of Structural Model

The results of the hypothesis testing reveal the following:

First, perceived information asymmetry in traceable meat significantly and positively influences perceived informativeness of meat traceability ($\beta=0.56$, $t=9.26$, $p<0.001$), subjective norm in traceable meat purchase ($\beta=0.46$, $t=7.34$, $p<0.001$), and perceived usefulness of meat traceability system ($\beta=0.27$, $t=4.40$, $p<0.001$). Therefore, H_{1a} , H_{1b} , and H_{1c} are supported.

Second, subjective norm in traceable meat purchase significantly and positively influences both perceived usefulness of meat traceability ($\beta=0.23$, $t=4.46$, $p<0.001$) and intention to purchase traceable meat ($\beta=0.24$, $t=3.97$, $p<0.001$). Hence, H_{2a} and H_{2b} are both supported.

Third, perceived informativeness of meat traceability system significantly and positively influences both perceived usefulness of meat traceability system ($\beta=0.42$, $t=6.46$, $p<0.001$) and intention to purchase traceable meat ($\beta=0.17$, $t=2.16$, $p<0.05$). Thus, H_{3a} and H_{3b} are also supported.

Finally, perceived usefulness of meat traceability system significantly and positively influences intention to purchase traceable meat ($\beta=0.34$, $t=4.17$, $p<0.001$). As a result, H_4 is also supported.

5. Discussion and Study Implications

This research explores the impact of perceived information asymmetry and its consequences on consumers' intention to purchase traceable meat. The analysis of structural model demonstrates a decent fit between the proposed model and the observed data, thereby, providing support for the hypothesised relationships. In summary, the four variables: perceived information asymmetry, perceived informativeness of the traceability system, subjective norm in the purchase of traceable meat, and perceived usefulness of the traceability system significantly determine consumers' intention to purchase traceable meat.

In looking at the theoretical implications of this study, it can be said that the findings contribute to the literature of consumer behavioural intention in traceable food marketing. It demonstrates a more comprehensive causal relationship among factors which could drive consumer intention to purchase traceable meat. A major contribution of this study includes the critical role of consumers' perceived information asymmetry in the acceptance of meat traceability technology. The results from H_{1a} , H_{1b} , and H_{1c} collectively provide evidence which suggest that perceived information asymmetry acts as the primary motivation for

consumers to use traceability technology (Hobbs, 2004; Ortega et al., 2011) as it drives all other variables in the model.

Moreover, this study also suggests that the two information-related variables of perceived information asymmetry and perceived informativeness can be incorporated into the technology adoption model. Based on the literature review, no previous studies had included these two information-related variables into a causal model to study the acceptance of traceable meat. Furthermore, this study had also located a new direction of relationship between perceived information asymmetry and perceived informativeness (H_{1a}). While previous research (i.e., Pavlou et al., 2007; Choe et al., 2009) suggest that perceived informativeness leads to information asymmetry, this research has unlocked an opposite finding i.e. that perceived information asymmetry influences perceived informativeness. The rationale is based on the premise that highly perceived information asymmetry may stimulate consumers' need to use technology in order to access more information, thereby, increasing consumers perceived informativeness of the traceability system. In addition, perceived information asymmetry is found to positively influence perceived usefulness, the core construct of TAM, and subjective norm of TRA (H_{1b} and H_{1c}). This finding also contributes to the traditional TAM and TRA models.

Regarding the influences of subjective norm, it is worthy to note that several technology adoption studies outside the traceability system context (e.g., Yi et al., 2006; Kim et al., 2009) had indicated significant relationships between two traditional constructs in TAM and TRA i.e., subjective norm and perceived usefulness (H_{2a}). As the current study also advocates that these two constructs are significantly related, the results drawn from this study not only provide replication but also an extension of the traditional TAM and TRA models to a new area of traceability system acceptance. The extended models confirm the role of subjective norm in traceable meat purchase, in relation to both perceived usefulness and intention to purchase (H_{2a} and H_{2b}).

From the results of H_{3a} and H_{3b} , the present study also reveals that perceived informativeness presents a particularly beneficial aspect of traceability technology that drives perceived usefulness of the traceability system and eventually, behavioural intention (van Rijswijk & Frewer, 2008; Tsai et al., 2014). Hence, information offered by traceability system is helpful in encouraging consumers to form a stronger intention to buy traceable meat (Mora & Menozzi, 2008; Zhao et al., 2010). In other words, this information-related characteristic (i.e., informativeness) of traceability system plays an important role in

purchase intention. Therefore, taking the role of information asymmetry and that of informativeness together, the results of this study suggest that information, as empirically displayed via these two information-related constructs, is the critical component of meat traceability system that drives consumers' response.

Further to that, the result of H_4 confirms the strong relationship existing between perceived usefulness of the traceability system and intention to purchase traceable meat. This finding is consistent with the findings of a previous study of consumers' adoption of food traceability in Taiwan (Tsai et al., 2014) thus, providing a replication for the robust relationship between these two variables.

Additionally, the present study makes a contribution to the cross-cultural food marketing literature with respect to consumers' intention to use traceability system in purchasing meat. Only a few studies have explored this topic in Thailand (Piemkhoontham & Ruenrom, 2010), and in the Asian context (Choe et al., 2009; Wu et al., 2011).

With regards to managerial implications, it appears that perceived information asymmetry is a fundamental antecedent of traceable meat purchase intention. Therefore, it may effectively persuade consumers to use the technology as a result of the detailed information provided of meat and its characteristics (Hobbs et al., 2005). In addition, it appears that the traceability system is helpful in narrowing the gap between the information that sellers and consumers have with regards to the meat. For example, meat sellers may design a leaflet to illustrate the actual information output that benefits consumers. The leaflet should also indicate the benefits of each piece of detailed information. If consumers perceive that they could access full information of the meat product, they would also perceive the informative and useful benefits of the traceability system. This can lead them to have a stronger intention to purchase traceable meat. Next, as the impact of subjective norm appears to be vital, the marketers must incorporate its role into their marketing plan. This way, when a marketer conveys the benefit of the meat traceability system, the target audience is not only meat end users but also their family, friends, or colleagues as social influence is identified as being crucial for the intention to purchase traceable meat.

6. Suggestions for Future Research

The present study has a number of limitations which suggest directions for future research. First, as the traceability system becomes more popular, future research may apply the model used in this study to

investigate other products such as halal food. This model can also contribute to the understanding of cross-cultural consumer behaviour in other ASEAN countries. Second, the use of student samples suggest that they lack the purchasing power. However, as the younger generation of participants are more technology savvy, they are more likely to be using technology as a means of making purchases, thereby turning themselves into future informed purchasers. Nevertheless, the replication of the present study with non-student sample is recommended as it can increase the generalisability of results. Furthermore, future studies may extend this proposed model by including other potentially relevant constructs such as perceived innovativeness, and attitude towards technology. Finally, future research may want to examine the relationships between information asymmetry and informativeness in greater depths for better understanding of the directions of the relationship.

7. Conclusion

Notwithstanding the study limitations, this research has contributed to extant literature in several aspects including (1) the introduction of perceived information asymmetry as the primary antecedent in this set of relationships, (2) the connection of traditional TAM and TRA via information asymmetry, and (3) the identification of traceability system characteristic (i.e., informativeness) that leads to the perception of usefulness of the traceability system in the Thai consumers' point of view. All the findings, when taken together with the model results, clearly demonstrate the mechanism by which perceived information asymmetry influences purchase intention (i.e., via perceived informativeness, subjective norm, and perceived usefulness).

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Appendix: Measurement Items

Variables	Items	Sources	
Perceived information asymmetry	ASYM1	The traceability system reduces the information gap in the quality of meat products between the producers and the consumers.*	Dunk (1993), Choe et al. (2009)
	ASYM2	The traceability system reduces the information gap in the circulation process of meat products between the producers and the consumers.*	
	ASYM3	The traceability system helps consumers have information on the quality of meat products in the extent more similar to that of the producers.*	
	ASYM4	The traceability system helps consumers have information on the circulation process of meat product in the extent more similar to that of the producers.*	
Perceived informativeness	INFO1	The traceability system will be able to give me quick and easy access to large scales of in-depth information.	Choe et al. (2009)
	INFO2	I am likely to learn a lot from the traceability system.	
	INFO3	The traceability system could give me extensive information.	
Subjective norm	SN1	Most people who are important to me think that it is fine to purchase meat with traceability.	Pavlou and Fygenon (2006)
	SN2	Most people who are important to me would purchase meat with traceability.	
	SN3	Most people who are important to me would encourage me to purchase meat with traceability.	

Continuation

Variables	Items		Sources
Perceived usefulness	PU1	Traceability system would be useful in purchasing meat products.	Pavlou and Fygenon (2006)
	PU2	Traceability system would enhance my effectiveness of purchasing meat products.	
	PU3	Traceability system would facilitate decision making in purchasing meat products.	
	PU4	Traceability system would provide more alternatives in purchasing meat products.	
Purchase intention	PI1	I plan to purchase meat with the traceability system.	Choe et al. (2009)
	PI2	I intend to increase the size of purchases for meat with the traceability system.	
	PI3	I intend to increase the frequency of purchasing meat with the traceability system.	

Note: * items reverse-coded

