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Abstract: During the COVID-19 pandemic, food safety scandals were common issues. This situation resulted in the rapid development of food traceability systems (FTS), which create transparency in tracking food products from manufacturing to consumption. So, this study empirically tests the elements of FTS by integrating the information system success model (ISSM) of DeLone and McLane on Chinese consumers' intention to purchase food using an FTS during a pandemic outbreak. Also, this study shows the significant mediating effect of perceived value, perceived safety, and perceived health benefits between the quality perspective of ISSM and purchase intention (PUI) as the dependent variable. This study provides insights for the further development of food traceability technologies.

Keywords: food traceability system; FTS; DeLone and McLane information system success model; food industry; COVID-19; purchase intention; PUI.

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1 Introduction

The world is under serious threat from the COVID-19 pandemic. Although the situation in China was generally stable until July 2020, the overall trend in the world was not encouraging. According to WHO (2020a), the total of confirmed cases in China has reached 89,270, with a total number of deaths of 4,693, by 10 August 2020. Also, the International Monetary Fund (2020) reports that China's GDP fell 6.8% in the first quarter from a year earlier. This dire situation has devastated many fields, and the food supply chain is one of these (Livermore and Shira, 2020).

Food safety during this period faces a significant challenge, one of which is food supply. The world's food supply was decimated, and an enormous number of people suffered hunger because of the coronavirus. It is still expected to double if the government does not act aggressively. Another issue that has plagued China for a long time is food quality and safety. From 2001 to 2013, China Central Television reported 71 major food safety events, and past recalls of food containing hazardous substances have significantly reduced consumer trust. (Li et al., 2020). For example, improper traders added melamine to milk powder in the melamine incident. It caused the formation of kidney stones in infants, which seriously harmed the health of infants and reduced the public's trust (Guan et al., 2009). More Chinese people are concerned about food safety than other essential safety issues, like environmental safety, public safety, and traffic safety (Lam et al., 2013). As indicated by WHO (2020b), there is no direct or clear evidence that COVID-19 can be transmitted through food packages or food. However, according to Rizou et al. (2020), they found that the COVID-19 virus can still reach fresh food via an individual cough or sneeze on it. Therefore, it appears that transmission can occur if someone spreads the virus to vulnerable areas soon after by hand or directly by eating. Moreover, WHO (2020b) discovered that coronavirus is stable at four °C and can remain at –20°C for up to two years, so it can still be transmitted via frozen food.

As consumers become more concerned about food safety, traceability becomes more critical; blockchain technology (BCT) is one of the systems that can improve traceability (Behnke and Janssen, 2020). IBM developed a blockchain-based FTS that caters to

Carrefour and Wal-Mart as the customers of this system (Dimitrov, 2019; Slocum, 2018). BCT, initially used in the financial field (Creydt and Fischer, 2019), is defined as decentralised ledgers linking each data block containing transaction data with a cryptographic pointer (Dinh et al., 2018). However, with its continuous development, its value in other fields has also been constantly developed, which applies to food traceability (Tsang et al., 2019). Applying blockchain to this area could facilitate anti-counterfeiting and product quality and increase transparency and trust (Galvez et al., 2018). The feasibility of using blockchain in the field of food traceability is reflected in the fact that verified data cannot be manipulated, namely the invariability of transaction data. And there is no third-party information exchange, and low-cost implementation can build trust in the supply chain network (Behnke and Janssen, 2020; Tsang et al., 2019). The capabilities of FTS and the requirements for a high-quality supply chain need to be discussed in detail to explore further how it can effectively address safety issues in the food supply chain in China during the COVID-19 pandemic.

The purpose of this study is to explore the contribution of FTS to addressing the value, safety, and health benefits in food supply during the COVID-19 pandemic and on-going food safety issues. The main objective is to study which factors using the DeLone and McLane ISSM on FTS can help improve the food safety problems during the COVID-19 pandemic and understand consumers' willingness to use FTS in purchasing food.

The rest of the study is presented as demonstrated: part 2 focuses on the relevant literature and proposed framework for analysis. Part 3 describes the research method. Part 4 introduces empirical results. Finally, it provides discussions, implications, and future research.

2 Literature review and hypothesis development

2.1 Food traceability systems

According to International Standardisation Organisation (2007), FTS is a system that can show the distribution of final products and the direct material suppliers of the products. It also maintains traceability records until the system can assess and deal with unsafe products. Tang et al. (2015) points out that a successful FTS should have five essential functions:

1 enhance the management of food supply

2 promote food safety and quality traceability

3 distinguish small quality attribute differences of food when selling

4 effectively utilise resources for food production

5 help establish long-term relationships.

The information gathered using the FTS can reduce the uncertainty in the food purchasing process. It can also ensure food quality, food safety and promotes the food industry's healthy development against the frequent food safety problems and chaotic management (Yuan et al., 2020; Chen and Huang, 2013). These technological advances have led to the increasing popularity of FTSs, which enabled the traceability of food

information (Yuan et al., 2020). China began using FTS to enhance pork traceability in 2004, but there is still much room for improvement (Tang et al., 2015). So, BCT is a practical system used to trace food (Tsang et al., 2019).

BCT is non-centralised, which is run by a trusted authority and has a transactional, distributed ledger (Behnke et al., 2020). It takes the form of a linked, encrypted small dataset or a public ledger (Crosby et al., 2016). This ledger record cannot be changed permanently after multiple parties reach a consensus, and the information never disappears after it is entered, which significantly ensures its reliability and validity (Creydt and Fischer, 2019). BCT is a powerful tool that can be easily applied to track global supply chains, enabling end-to-end traceability while allowing consumers to access labels on numerous digital devices to get detailed information about the food at each step of the production process (Tsang et al., 2019). Galvez et al. (2018) noted that a BCT business model could greatly enhance trust, transparency, security, confidentiality, and increased efficiency. BCT can often significantly reduce friction and unlock more excellent economic value for individuals with multiple parties involved in a transaction or a business that collaborates across various organisations. Therefore, we inferred that ISSM (e.g., information quality, system quality, service quality) and product diagnostics would impact customers' perceived value, perceived safety, and perceived health benefits, in turn, influence consumer PUI further.

2.2 Information system success model

Many scholars adopted the ISSM for empirically measuring the performance of any information technology (Duan et al., 2017), so firms can make intelligent decisions regarding their IS investments (DeLone and McLean, 2004). They proposed three significant dimensions of IS quality: information quality, system quality, and service quality.

2.2.1 Information quality

Bei and Jiabao (2015) stated that the quality of traceable information refers to the accuracy, richness, readability, and authority of information that customers can perceive. High-quality information can assist consumers understand products comprehensively and objectively, address information asymmetry, and build affection for traceable foods (Yuan et al., 2020). According to Aung and Chang (2014), FTS can provide high-quality and accurate information. Companies can use the information provided by FTS to check the status of their products and give feedback to their customers, who can receive this high-quality information and ensure the safety of the food, which is a fundamental reason for operating an FTS system. The more detailed and accurate the information is, the more customers can verify the safety of the food themselves, and the less time it takes to perceive the safety of the food. Nutrition is one of the essential factors and one of the most important factors consumers perceive to maintain health (Chen and Huang, 2013). With high-quality, traceable information, customers also have a clearer understanding of the nutritional content of products and will perceive them as nutritional healthy (Lee and Goudeau, 2014). So, we propose that:

H1a INQ positively affects perceived value (PEV) of FTS.

H1b INQ positively affects perceived safety (PES) of FTS.

H1c INQ positively affects perceived health benefit (PHB) of FTS.

2.2.2 System quality

System quality is the quality of the data processed by the system and the system's overall performance (e.g., user-friendly, easy to use, easy to maintain, and adequate functionality of data), which represents the technical aspect of FTS (Duan et al., 2017). Delone and McLean (2004) emphasise that availability, reliability, adaptability, and responsiveness become essential in the current world of e-commerce. System quality plays a vital role in the successful operation of system functions and the business's success (Gorla et al., 2010). The higher the reliability and responsiveness of the FTS, the less likely the customer is exposed to unsafe food products as the food moves from farm to table. The better the system's ability to process data, the more details the customer can learn about the product, the better for customers to judge its value and nutrition (Tsang et al., 2019). Thus, we give the following hypothesis:

H2a SYQ positively affects PEV of FTS.

H2b SYQ positively affects PES of FTS.

H2c SYQ positively affects PHB of FTS.

2.2.3 Service quality

Delone and McLean (2004) consider service quality as the overall support provided by the service provider throughout the system's operation. They argue that the quality of service is becoming more and more important nowadays because it is easy to give business reviews. Bad reviews due to bad service can lead to unpredictable losses for the business. Gorla et al. (2010) argue that quality service needs to meet the customer's needs at the specified time and remain reliable, quick response, provide assurance, and have empathy. As stated by Lin et al. (2021), the service quality of FTS refers to the technological ability, responsiveness, simplicity, and trustworthiness of the system. High-quality traceability services can add specific product knowledge to the customer's perception of the product. Many customers need proof that the product is free of additives and adding this proof to the system. Based on the above information, we hypothesise that:

H3a SEQ positively affects PEV of FTS.

H3b SEQ positively affects PES of FTS.

H3c SEQ positively affects PHB of FTS.

2.2.4 Product diagnosticity

Jiang and Benbasat (2014) pointed out that the diagnostic nature of products means that people evaluate products based on specific information. However, retailers may falsify product information, resulting in information asymmetry. FTS can act as a third-party platform for information checking and product evaluation, providing consumers with reliable information and helping them make in-depth product diagnoses (Chen and Huang, 2013). The traceability system helps consumers eliminate false information and diagnose products with honest and accurate information, improving efficiency, making

them more likely to buy high-quality and nutritious products, and reducing the probability of safety problems caused by purchasing substandard products (Yuan et al., 2020). Based on the above research, we make the following assumptions:

H4a PRD positively affects PEV of FTS.

H4b PRD positively affects PES of FTS.

H4c PRD positively affects PHB of FTS.

2.2.5 Impact of perceived value on purchase intention

The consumer perceived value of a product reflects the overall performance (Yuan et al., 2020) and usefulness (Tseng et al., 2022) of FTS. As stated by Ingrassia et al. (2017), some new details on food provided by FTS can be sufficient to increase consumers' perceived value of the product. According to Van Rijswijk and Frewer (2008), the perceived value associated with FTS are control, health, quality, and safety associated with trust and regarded as vital to food in general. Previous literature suggested that consumer perceived value significantly influences PUIs (Ryu et al., 2012; Yuan et al., 2020). In addition, Yuan et al. (2020) found out that customers would be more willing to purchase traceable food products that they perceive value. Therefore, we hypothesised that:

H5a PEV positively affects PUI of food using FTS.

H5b PEV positively mediates the relationship between INQ and PUI of food using FTS.

H5c PEV positively mediates the relationship between SYQ and PUI of food using FTS.

H5d PEV positively mediates the relationship between SEQ and PUI of food using FTS.

H5e PEV positively mediates the relationship between PRD and PUI of food using FTS.

2.2.6 Impact of perceived safety on purchase intention

Perception of food safety refers to the perception of substances that may be harmful to health in food, such as how safe the food processing process is and whether harmful chemical additives or pesticide residues are on the food (Wang and Tsai, 2019). Due to several food safety scandals in China involving foods that contained harmful substances, such as the melamine to infant milk powder and excessive clenbuterol in pork, Chinese consumers pay more attention to food safety, and they are willing to pay higher prices for safe and secure food (Tang et al., 2015). The FTS can significantly increase food safety and reduce hazards during the whole process of food production and sale (Aung and Chang, 2014). According to Wang and Tsai (2019), customers' perceived safety positively impacts their PUIs. We make the following hypothesis:

H6a PES positively affects PUI of food using FTS.

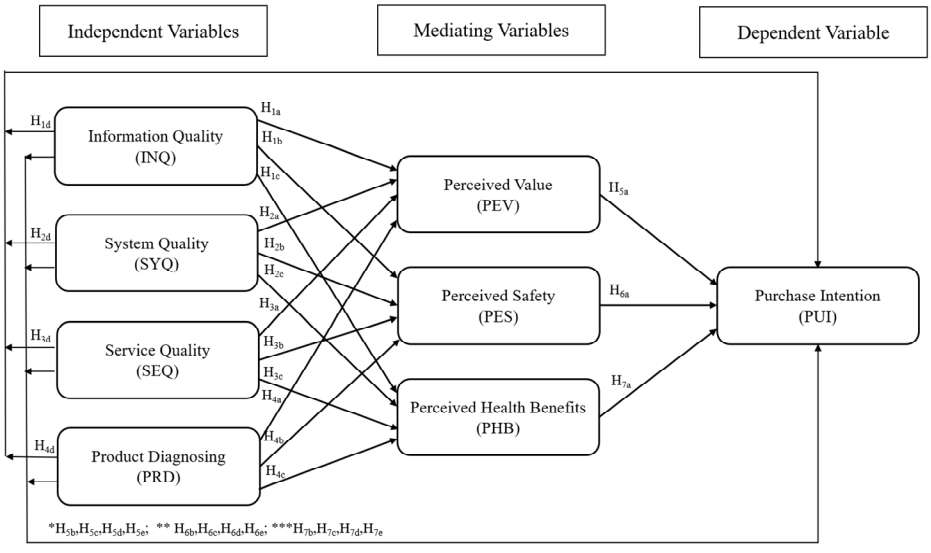
H6b PES positively mediates the relationship between INQ and PUI of food using FTS.

H6c PES positively mediates the relationship between SYQ and PUI of food using FTS.

H6d PES positively mediates the relationship between SEQ and PUI of food using FTS.

H6e PES positively mediates the relationship between PRD and PUI of food using FTS.

Figure 1 Conceptual model



Notes: *Mediating effect of PEV between independent variables and PUI.
** Mediating effect of PES between independent variables and PUI.
***Mediating effect of PHB between independent variables and PUI.

2.2.7 Impact of perceived health benefit on purchase intention

Health is an essential indicator of people's well-being, and Chinese people have placed great importance on health and nutritional balance since ancient times (Liu and Zhang, 2019). Chen and Lobo (2012) found that consumers who self-perceived their health as unsatisfactory will be more interested in their food's nutritional content and nutritional value and will pay more attention to the nutritional content label of their products. According to The Lancet (2015), more than 95% of the world's population has some degree of health problem. It means that most people worry about their health, which enhances their possibility to buy nutritious food. Previous research has shown that customers' perceived health benefits positively and strongly affect PUIs (Wang and Tsai, 2019). Therefore, we make the following hypotheses about perceived health benefits:

H7a PHB positively affects PUI of food using FTS.

H7b PHB positively mediates the relationship between INQ and PUI of food using FTS.

H7c PHB positively mediates the relationship between SYQ and PUI of food using FTS.

H7d PHB positively mediates the relationship between SEQ and PUI of food using FTS.

H7e PHB positively mediates the relationship between PRD and PUI of food using FTS.

Based on the aforementioned literature, this study proposes the conceptual model shown in Figure 1.

3 Research method

3.1 Data collection and demographic profile characteristics

An online questionnaire was employed to collect data to analyse the effect of the FTS on customers' food PUI. The participants were Chinese customers from different regions, education levels, and food purchasing experiences. A total of 470 respondents as shown in Table 1, including 195 males and 275 females. The concentration of their ages are 18 to 22 (11.70%), 23 to 27 (17.02%), 28 to 32 (17.87%), 33 to 37 (15.96%), 38 to 42 (16.17), 43 to 47 (13.19), and the rest is from 48 to above 53 (8.08%). The majority of them have bachelor's degrees (93.40%). Moreover, the most common food purchases are made in supermarkets (48.30%) and online shopping (32.55%).

Table 1 Demographic profile of respondents

Demographics	*Frequency*	*%*
Gender		
Male	195	41.49
Female	275	58.51
Age		
18–22	55	11.70
23–27	80	17.02
28–32	84	17.87
33–37	73	15.96
38–42	76	16.17
43–47	64	13.19
48–52	27	5.74
Above 53	11	2.34
Education		
Less than high school	15	3.19
Bachelor 's degree	439	93.40
Graduate school or higher	16	3.40

Table 1 Demographic profile of respondents (continued)

Demographics	*Frequency*	*%*
Where do you buy food?		
Convenience store	5	1.06
Supermarket	227	48.30
Traditional market	85	18.09
Online	153	32.55

3.2 Measures

The measurements in this research are based on previous literature with appropriate modifications to suit the purpose of this research. The measures of INQ, PRD, and PEV came from the study of Yuan et al. (2020). PES and PUI were measured using Yuan et al. (2020) and Wang and Tsai's (2019) study. PHB was measured using the items from Wang and Tsai's (2019) study. Measurements of SYQ and SEQ were based on Delone and McLean's (2004) study. The online questionnaire used a 7-point Likert scale for all data, ranging from 1 to 7, with 1 representing strongly disagree and 7 representing strong agree. To verify the reliability of this measurement, 470 valid data were tested and collected.

3.3 Reliability and validity test

Table 2 shows the validity test and internal consistency, which include the following elements: standardised factor loading (SFL), composite reliability (CR), average variance extracted (AVE). Based on the statistical analysis, the constructs show that it passed the Kaiser-Meyer-Olkin (KMO) (Kaiser, 1970) with .906, which is greater than 0.5. It also indicates that Bartlett's Test of Sphericity (Bartlett, 1950) is significant at $p < 0.01$, which shows the adequacy of the items. Moreover, SFL items range from 0.707 to 0.889 are greater than 0.5, so there are no deleted items (Hair et al., 1998). Also, all variables satisfy the minimum acceptable value of greater than 0.7 of CR, ranging from 0.842 to 0.903 (Nunnally and Bernstein, 1994).

Table 2 also presents the AVE values ranging from 0.571 to 0.694, which meet the standard for convergent validity greater than 0.5 (Hair et al., 1998).

Table 2 Internal consistency and convergent validity analysis

Construct/items		*SFL*	*CR*	*AVE*
Information quality (INQ) – (Yuan et al., 2020)			*0.886*	*0.609*
INQ1	The FTS can provide detailed information	0.771		
INQ2	The FTS can provide credible information	0.749		
INQ3	The FTS can provide accurate information	0.794		
INQ4	The FTS can provide useful information	0.818		
INQ5	The FTS can provide reliable information	0.768		

Table 2 Internal consistency and convergent validity analysis (continued)

Construct/items		*SFL*	*CR*	*AVE*
System quality (SYQ) – (Delone and McLean, 2003)			*0.903*	*0.651*
SYQ1	The FTS is easy to use	0.739		
SYQ2	The FTS is easy to navigate	0.816		
SYQ3	The FTS is timely	0.868		
SYQ4	The FTS is convenient to use	0.859		
SYQ5	The FTS provides an appropriate format	0.743		
Service quality (SEQ) – (Yuan et al., 2020)			*0.892*	*0.623*
SEQ1	The FTS provides service quality	0.707		
SEQ2	The FTS provides assurance	0.817		
SEQ3	The FTS provides safety of traceability food processing	0.823		
SEQ4	The FTS safety of traceability of food logistics	0.804		
SEQ5	The FTS safety of traceability food retail	0.790		
Product diagnosticity (PRD) – (Yuan et al., 2020)			*0.865*	*0.617*
PRD1	The FTS can help me carefully evaluate the products	0.714		
PRD2	Careful evaluation of the product will make it easier for me to purchase products	0.788		
PRD3	The FTS can help me get the real feeling of the product	0.838		
PRD4	The FTS can help me feel safe	0.797		
Perceived value (PEV) – (Yuan et al., 2020)			*0.864*	*0.615*
PEV1	Food with FTS has a high value in use	0.765		
PEV2	Food with FTS has valuable use	0.782		
PEV3	Food with FTS has a higher value for money	0.805		
PEV4	Food with FTS has valuable gain such as time savings	0.783		
Perceived safety (PES) – (Wang and Tsai, 2019)			*0.842*	*0.571*
PES1	I believe food with FTS is safe	0.734		
PES2	I feel that food with FTS is hygienic	0.727		
PES3	I believe food with FTS is clean	0.768		
PES4	I feel that food with FTS contains no chemical residues	0.791		
Perceived health benefits (PHB) – (Wang and Tsai, 2019)			*0.901*	*0.694*
PHB1	Food with FTS keeps you healthy	0.810		
PHB2	Food with FTS is good for your body	0.889		
PHB3	I feel that food with FTS is nutritious	0.806		
PHB4	I believe that food with FTS contains a lot of nutrients	0.825		
Purchase intention (PUI) – (Yuan et al., 2020)			*0.855*	*0.597*
PUI1	Food with FTS can arouse my interest in purchasing	0.745		
PUI2	I will buy food that uses FTS	0.760		
PUI3	I will give priority to food with FTS	0.792		
PUI4	I am willing to pay for food with FTS	0.791		

Table 3 Cronbach α, correlation analysis, and √AVE

	α	*Mean*	*Sd*	*INQ*	*SYQ*	*SEQ*	*PRD*	*PEV*	*PES*	*PHB*	*PUI*
INQ	0.865	4.865	1.237	0.780							
SYQ	0.923	4.421	1.337	0.351**	0.807						
SEQ	0.910	4.524	1.280	0.358**	0.427**	0.789					
PRD	0.920	4.796	1.262	0.414**	0.422**	0.448**	0.784				
PEV	0.899	4.904	1.106	0.448**	0.382**	0.385**	0.400**	0.756			
PES	0.905	4.804	1.244	0.468**	0.401**	0.472**	0.385**	0.481**	0.833		
PHB	0.931	4.465	1.344	0.285**	0.329**	0.311**	0.405**	0.370**	0.300**	0.773	
PUI	0.915	4.758	1.153	0.334**	0.432**	0.375**	0.470**	292**	0.436**	0.508**	1

Note: **: p-value < 0.01.

Table 3 shows the reliability test of Cronbach's alpha (α), in which all constructs are greater than .7. Furthermore, it presents the √AVE of all variables, which are greater than the correlation coefficients of each variable ranging from .756 to .833 (Farrell, 2010). Therefore, we summarised that the dataset is sufficiently adequate for further analysis because all variables have met requirements.

4 Findings

The empirical test was performed using PROCESS version 4 by Hayes in SPSS as a statistical tool to examine the hypothesis by estimating the path coefficients between independent and dependent variables and testing the indirect effect of the mediation variables (Hayes, 2013).

4.1 Hypotheses testing

Table 4 showcases the path coefficients for each variable. First, it shows the relationship of INQ to mediating variables namely PEV (β = 0.276, t = 6.267, $p < 0.001$), PES (β = 0.285, t = 6.703, $p < 0.001$), and PHB (β = 0.190, t = 1.920, $p < 0.001$). Thus, H1a, H1b, and H1c are supported. Also, it shows the direct effect of INQ to PUI (β = 0.195, t = 2.156, $p < 0.001$). Hence, H1d is supported. Second, it shows the relationship of SYQ to mediating variables namely PEV (β = 0.156, t = 3.455, $p < 0.001$), PES (β = 0.151, t = 3.465, $p < 0.001$), and PHB (β = 0.143, t = 2.973, p < 0.001). Hence, H2a, H2b, and H2c are supported. In addition, it shows the direct effect of SYQ to PUI (β = 0.231, t = 5.108, $p < 0.001$). Thus, H2d is supported. Third, it shows the relationship of SEQ to mediating variables namely PEV (β = 0.151, t = 3.289, $p < 0.001$), PES (β = 0.269, t = 6.072, $p < 0.001$), and PHB (β = 0.100, t = 2.054, $p < 0.001$). Thus, H3a, H3b, and H3c are supported. Also, it shows the direct effect of SEQ to PUI (β = 0.116, t = 2.535, $p < 0.001$). Hence, H3d is supported. Fourth, it shows the relationship of PRD to mediating variables namely PEV (β = 0.152, t = 3.257, $p < 0.001$), PES (β = 0.183, t = 1.843, $p < 0.001$), and PHB (β = 0.263, t = 5.279, p < 0.001). Thus, H4a, H4b, and H4c are supported. Also, it shows the direct effect of PRD to PUI (β = 0.282, t = 6.050, $p < 0.001$). Hence, H4d is supported. Lastly, it shows that relationship between mediating variables and dependent variable: PEV→PUI (β = –0.016, t = –0.325, $p = 0.725$), PES→PUI (β = 0.318, t = 7.371, $p < 0.001$), and PHB→PUI (β = 0.418, t = 10.252, $p < 0.001$). Thus, H5a is rejected while H6a and H7b are supported.

4.2 Mediating analysis

Table 5 shows that all mediating variables positively mediate the relationship between the independent and dependent variables. Process bootstrapping shows that the lower and upper bounds confidence intervals do not include zero (0), which determines the indirect effect of all mediating variables is significant. Furthermore, using the Sobel test, the z-score values of all paths were greater than 1.96 and significant at p < 0.001 p < 0.001which is the acceptable standard for mediation effects. Thus, all mediating effect hypotheses (H5b, H5c, H5d, H5e, H6b, H6c, H6d, H6e, H7b, H7c, H7d, and H7e) are supported.

Table 4 Summary of hypothesis testing results

Hypotheses		*Coeff.*	*Results*
H1a	INQ→PEV	0.276**	Supported
H1b	INQ→PES	0.285**	Supported
H1c	INQ→PHB	0.190**	Supported
H1d	INQ→PUI	0.195**	Supported
H2a	SYQ→PEV	0.156**	Supported
H2b	SYQ→PES	0.151**	Supported
H2c	SYQ→PHB	0.143**	Supported
H2d	SYQ→PUI	0.231**	Supported
H3a	SEQ→PEV	0.151**	Supported
H3b	SEQ→PES	0.269**	Supported
H3c	SEQ→PHB	0.100**	Supported
H3d	SEQ→PUI	0.116**	Supported
H4a	PRD→PEV	0.152**	Supported
H4b	PRD→PES	0.183**	Supported
H4c	PRD→PHB	0.263**	Supported
H4d	PRD→PUI	0.282**	Supported
H5a	PEV→PUI	0.116**	Supported
H6a	PES→PUI	0.318**	Supported
H7a	PHB→PUI	0.418**	Supported

Note: **p-value < 0.010.

Table 5 Summary of the indirect effects

Models		*Coeff.*	*se*	*95% CI LLCI*	*95% CI ULCI*	*Sobel test*
H5b	INQ→PEV→PUI	0.075	0.026	0.029	0.133	3.535**
H5c	SYQ→PEV→PUI	0.049	0.018	0.017	0.088	3.115**
H5d	SEQ→PEV→PUI	0.060	0.021	0.024	0.107	3.494**
H5e	PRD→PEV→PUI	0.045	0.020	0.009	0.090	2.689**
H6b	INQ→PES→PUI	0.157	0.028	0.105	0.215	6.435**
H6c	SYQ→PES→PUI	0.109	0.022	0.070	0.157	5.803**
H6d	SEQ→PES→PUI	0.143	0.027	0.095	0.199	6.119**
H6e	PRD→PES→PUI	0.106	0.024	0.064	0.158	5.612**
H7b	INQ→PHB→PUI	0.120	0.025	0.075	0.169	5.577**
H7c	SYQ→PHB→PUI	0.117	0.024	0.075	0.166	6.086**
H7d	SEQ→PHB→PUI	0.122	0.024	0.079	0.171	5.914**
H7e	PRD→PHB→PUI	0.141	0.022	0.100	0.187	6.695**

Note: **p-value < 0.01.

5 Conclusions and implications

5.1 Conclusions

The findings of this empirical study conducted in China during the COVID-19 pandemic food safety problems show that the proposed conceptual model adequately validates the given constructs. This study makes a theoretical contribution to research on FTS. During the last decade, due to the prevalence of food safety issues in China, FTS has been explored by several scholars in their attempt to understand consumers' behaviour towards traceability technologies (Duan et al., 2017). So, this research identifies the DeLone and McLane IS quality factors (i.e., INQ, SYQ, and SEQ) and product diagnosticity of FTS as antecedents of PUI to buy food from the market using FTS. The consumer willingness to purchase food using FTS is a significant factor in understanding the technology adoption of FTS.

First, Chinese consumers are willing to purchase foods when FTS. First, the findings supported previous studies (e.g., Yuan, Wang, and Yu, 2020) on information quality (i.e., detailed, credible, accurate, useful, and reliable) which is perceived as the quality of the outputs the FTS is providing the customers. Second, system quality which pertains to the ease of technicality of FTS, such as ease of use and convenience of the FTS, positively influences consumers' intention to purchase, which supported the study of Lin et al. (2021). Third, service quality significantly affects PUI, which pertains to the support provided to consumers, which are vital elements of FTS (Lin et al., 2021). Fourth, product diagnosticity is a critical element that helps consumers accurately evaluate food safety and quality, which positively influences PUI, which supported the study of Yuan, Wang, and Yu (2020). Fifth, due to the globalisation of the food supply chain, consumers are concerned with safety and the perceived value and health benefits concerns.

The findings show that all independent variables positively influence the mediating variables that determinants the measurement of usage intention of FTS. The result concerning the perceived value supported the study of Yuan et al. (2020) on the significant role of FTS perceived value in Chinese consumers. In addition, as Aung and Chang (2014) stated, FTS guarantees food quality and food safety, which is also consistent with the results of this study. Van Rijswijk and Frewer (2008) also found that consumers will base their PUIs on the concepts of safety and quality (e.g., health benefits). In conclusion, it is hoped that these findings from Chinese consumers could contribute to FTS literature in food supply systems across the world.

5.2 Implications

When food safety problems are frequent in China, especially with the prevalence of COVID-19 worldwide, this virus can be spread through the cold chain and other foodborne pathways. Therefore, the proper use of FTSs can enhance food safety and reduce the possibility of virus transmission. To use FTS in a more efficient and standardised manner, the relevant government agencies need to formulate policies to regulate and promote FTS to improve the quality of food information. Businesses can increase consumers' knowledge of FTS and how to use it through appropriate marketing methods – for example, they create a video campaign of the food supply chain to understand deeply how food information is entered into FTS. Also, they need to provide demo videos on how to use FTS efficiently to get the information they need. In addition,

companies can use cloud storage to enhance data storage capacity or work with upstream and downstream companies to build a supply chain database so that FTS contains more comprehensive information to meet consumers' needs (Tang et al., 2015). Developing and implementing FTS in different food sectors or in every step of the supply chain process is a complex task that requires companies' motivations to innovate. Proper implementation of FTS can provide transparency of food information flow that will improve the food supply chain management as a whole.

5.3 Limitations and future research

This study analyses the factors influencing consumers' PUIs to buy food using FTS. The limitations of the study provide additional opportunities for future research. First, the study subjects were from various parts of China with different geographic locations and cultural backgrounds. Future research could also examine the moderating effect of demographic variables or compare and contrast different provinces to further enhance the credibility of the findings of this study. Second, this research is conducted based on the consumer side, downstream of the food supply chain. Future research could consider the company's or suppliers' perspectives towards FTS. Lastly, it is suggested that future researchers further investigate different types of FTS in relation to consumers' actual use and purchase behaviour.

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