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THE INNOVATION OF BLOCKCHAIN TRANSPARENCY& TRACEABILITY IN LOGISTIC FOOD CHAIN

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ABSTRACT

Purpose: The purpose of this study is to use the concept of adopting technological innovation as a basic framework for monitoring the food supply chain. In addition, the application of this technique to improve the transparency of the food supply chain. Furthermore, A conceptual model has been developed, and the research culminates in the impacts of the transparent supply chain for food traceability.

Theory: The unified theory of acceptance and use of technology (UTAUT2).

Methodology: A detailed questionnaire used to collect official data (raw data) from the logistic food industry (LFI) in Asia. Blockchain enthusiasts and potential blockchain users worldwide. The sample size was 474.

Tools: The study used SPSS tools for analyses the underlying structures. Also, it is suitable to show the measurement model (external model) and the structural model (internal model).

Significant: This research will significantly contribute to blockchain businesses and merchants in Asia. Blockchain can raise the transparency of the supply chain to a new level. Also,this study will enhance the understanding of current blockchain technologies effect in food supply transparency.

Originality: This isvery newresearch that describes the blockchain effect in Asiafood logistics and food traceability.

KEYWORDS: Blockchain; Technology Adoption; Traceability; Transparency & UTAUT

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Original Article

1. INTRODUCTION

Blockchain technology generates a sensation in logistics chain management (LCM).This technology was mainly associated with product tracing[1] and was able to establish a secure and transparent transaction. Now that supply chain executives have become aware of this new technology's potential. It must be more clear. Consequently, the introduction of this technology in time because customers are calling for accountability with respect to supply. Consumers, for example, also want food purchase and consumption guarantees[2]. Such problems are compounded by global growth in supply chains. Blockchain technology aims to radically improve transaction processes and offers a clear and reliable record of inspection. Blockchain technologies are widely used and built in the financial sector [3-5], but are also important for the food industry and management of the logistics chain.

Awaysheh& Klassen [6] defines transparent information and available for both parties in return, as well as for external observers. In the supply chain Context, transparency refers to the information available to companies involved in the supply network. Monitoring the supply chain improves clarity to implement the objectives of the organization,raw material assets and provide context for a final product or service. Blockchain technologiesoffer greater transparency in the supply chain, but more importantly, it creates immutable stability.

Researchers have determined that greater transparency and traceability are associatedwith a better transaction in business as well as system. Skelton and Robinson[7] describe traceability as the ability to recognize and verify event chronology components in all process phases. However, The relationship between the transparency of the supply chain and tracking is linear and straightforward.Although there is more information available can increase tracking may not increase transparency. Tracking is obstructed when physical information is incomplete or missing.However, the monitoring is limited by the complexity within the supply network. For example, a source coffee bean product is less complicated than a multinational group of companies that collect coffee beans. It consists of hidden elements and raises questions about useful and safe surveillance. Also, [8] supply chain scientists are among the most eligible to answer such questions because of their value chain overview.Therefore, a blockchain-based logistic chan can overcome this traceability and transparency issue of food industries.

2. BACKGROUND AND LITERATURE REVIEW

2.1. Blockchain

Blockchain uses a mutually distributed ledger based on a series of innovations usedto organize and share digital data. As defined by [11], the process of transforms the solid (for example, raw materials) and the intangible (for example, property)in the encrypted token, which can be recorded, tracked and traded using a private key on a specific keychain. It can achieve greater control over the origin and supply chain.Tracking can be enabled using tracking technologies such as RFID, NFC tags andIoT technologies. As seen from Blockchain, technologyis the digital traceability is an effective and proven mechanism to achieve distribution of product trace inthe retail sector.The consensus in an unstable dynamic network environment for unreliable participants [12.13].An benefit of working in a digital environment is the ability to construct algorithm programs that can be introduced or applied partially when such conditions arise without human interaction. [14] says Blockchain can help accelerate supply chain integration. Nonetheless, with already developed industries and businesses, they may not be very prepared to invest in a blockchain that provides no major advantages over current solutions. Much to learn about this new technology.

2.2. Blockchain Transparency

Like supply chain monitoring, the supply chain definition reflects accountability and information is accessible to end-users and supply chain companies. Coating refers[15] to different degrees of supply chain knowledge sharing (also known as "visibility") within the supply chain network. Lamming suggests that it is open and supply chains need to provide consistent awareness to all stakeholders, contributing to normalization of information control during negotiations. Ultimately, it provides more information about component properties and processes. See table 1.

Table 1

	Opaque	Translucent	Transparent
Business case	For whatever cause, no information is exchanged between the parties; even operational, day-to-day information is obscured	Outline information is only shared-conditions or partial data. This can be a collaborative black box concept. If used tactically, it may be like cheating	Knowledge is exchanged selectively and justifiably. Project information includes common awareness and communication skills

2.3. Traceability & Blockchain

Blockchain properties particularly suitable for tracking thatrelated goods and documents (such as bill of lading or shipping notifications) pass from one representative in another supply chain. Also, items are subject to forgery or theft. Furthermore, blockchain technology involves creating a digital token that links to physical elements when created. The item 's final receiver will authenticate the symbol that will trace the story to its roots. End-users are more secure in the Blockchain knowledge they get. Due to the linear flow of most products from the source of the materials to the final consumer, Blockchain is considered adequate technology to allow monitoring of the supply chain.

2.4. Traceability Applications & Blockchain

January In the supply chain, yellowfin tuna and fish were monitored from fishermen to distributors. End users can follow their tuna sandwiches' "history" via a smartphone, identifying producers and suppliers information. Each unit of measurement (by fish or bycatch) has been identified with a digital "symbolic code" to validate and track the origin of a fish along the supply chain, providing a viable model for end-consumer product certification.

3. THEORETICSOURCE

3.1. UTAUT

The Unified Theory of Acceptance and Use of Technology (UTAUT) is developed through review and integrate eight prevailing theories and models. Eachmethod has been widely used in many academic disciplines for individual research. Venkatesh et al. [20] Synthesis of this alternative opinions about user acceptance, innovation and the creation of a UTAUT framework. The study revealed that contribution models showed between17 and 53 percent of the variation in user intentions.However, it was discovered that UTAUT has superior performance of individual models. The researcher empirically proves their safety as a methodology to explain the acceptance of different technology and its use in companies.

The UTAUT model has four main effects of intention and intentions of use: performance expectation, expected effort, social impact and facilitation of circumstances. They were based on strong empirical relationships, theory and included inthe conceptual framework. This article was retained because it proved to be decisive factors in previous research.

Table 2

S. No	Theory	Source	Description
1	The Theory of ReasonedAction (TRA)	Ajzen & Fishbein[22]	TRA is used to predict individual behaviour based on pre-existing attitudes and intentions
2	The TechnologyAcceptanceModel (TAM)	Davis [23]	End-user use and acceptance model

3	The Theory of Planned Behavior (TPB)	Ajzen [24]	TPB is the first model to mention psychological factors related to technology acceptance
4	A combined TBP/TAM	Taylor and Todd [25]	The Theory of Planned Behavior (TPB)
5	The Model of PC Utilization	Thompson [26]	A competing perspective to TRA and TPB used to predict userbehaviour rather than the intention to use
6	Diffusion of Innovation Theory (DIT)	Rogers [27]	DIT describes how technological innovation moves from invention to widespread usage
7	Social Cognitive Theory (SCT)	Bandura [28]	Stipulates environmental influences (e.g., social pressures) or unique personal factors (e.g., Personality) are equally significant in determining behaviour
8	The Motivational Model	Davis [29]	The core constructs of the theory are extrinsic and intrinsic motivation

3.2. The Notion of Technical Innovation Adoption

Performance expectancy positively impacts the behavioural intention of using blockchaintechnology for supply chain traceability.Behaviour intention and usage behaviour are strongly influenced bytrust. Also, Trust as an essential factor for supply chains to work effectively due to the underlying information interdependence between organizations. It only makes sense that a company is relying on its business partners. Moreover, Lippert [30] provides a structure for the trust framework concerning the adoption of technological innovation.It includes two types of trust: trust in technology and trust between organizations.

4. Theoretical Framework

This research develops a UTAUT-based conceptual model. The model offers theoretical guidance for the creation of a research system for Blockchain adoption and use. Techniques applied to the monitoring of the logistic traceability in the food industry. Also, this research offers trusted builders to adopt IT innovation, which isessential to explore the promise of the inherent qualities of Blockchain to support transparency. The following proposals explore the relationships between search variables that include the decision model to use Blockchain in the supply chain food logistics. The model of this study in figure 1.

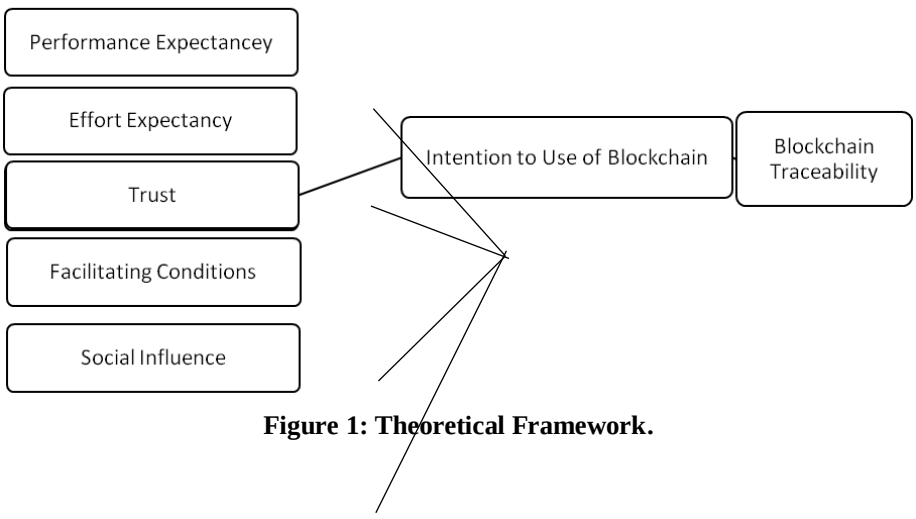

Figure 1: Theoretical Framework.

4.1. Performance Expectancy

The predicted performance is the degree to which new technology will benefit the customer. Planned advantages of different actions[31]. It makes sense that the more a user uses a tool, the more he expects to use it, the better his results. Williams et al. [21] are potentially the best predictors of the traceability of the blockchain in the food industry. Bartlett, Julian and Baines[32] clarify that greater clarity contributes to more outstanding results, given the greater awareness of its effect on the logistic food chain that participants were able to prepare better. Blockchain offers a solution with an increase in logistics chain and food traceability for a single reliable source of distributed information [33].

H1: Performance expectancy positively impacts the intention to use of Blockchain of using blockchain traceability for food logistics.

4.2. Effort Expectancy

The expected effort indicates the ease of use of blockchain technology. People are less likely to use technologyif it feels more challenging to use; it requires an effort of existing methods. Effort expectancy andperformance expectations are closely related.However, the first one is more compatible withefficiency expectations and the latter effectively [34]. The efficiency of supply chain operations affectsthe competitive organization is made up of many factors. Information exchange methodologies such as vendor-managed inventory (VMI) create useful models for replenishment without needing them [35]. Similarly, the Blockchain allows the use of the "smart contracts" on which it is basedthe user establishes rules that require little human intervention.

H2: Effort expectancy positively impacts the intention to use of Blockchain of using blockchain traceability for food logistics.

4.3. Trust

Technology trust is unique as it defines human-technology relations. Researchers in human-machine interactions have no new faith in technology[40]. Technology 's reputation affects people's attitude to this technology, which also affects the plan to use it. For instance, if users view blockchain technology as unsafe, their use in the real world would be more inefficient. However, the higher the experience is, the more users understand and use technology. Baker, Arsal and Roberts [41] established a lack of dependence on information technology, which might make the use of the facility or product stop or investigate. Technologies are also important for understanding the preferences of end-users as a result of a lack of faith in trust or performance. these beliefs.

H3: Trust positively impacts the intention to use of Blockchain of using blockchain traceability for food logistics.

4.4. Facilitating Conditions

Venkatesh et al. [20] indicate that the terms of facilitation are defined according to what the end-users believe. The companies technical infrastructure supports the use of the system. The highly interconnected nature of blockchain applications requires the availability of technical resources to allow their use. The lack of resources has a negative effect when using it similarly if there is no organizational support for the purpose of Blockchain with the compatible systems within the organization.

H4: Facilitating conditions (i.e., practical resources and administrative provision) positively impact the intention to use of Blockchain of using blockchain traceability for food logistics.

4.5. Social Influence

Social influence is defined as the extent to which an individual understands the importance of others to believe. By design, blockchain applications are considered new technologies. Social influence helps the user to use new technology such as Blockchain for traceability.

H5: Social influence positively impacts the intention to use of Blockchain of using blockchain traceability for food logistics.

4.6. Intention to use of Blockchain

Social psychologists discovered intentions to use blockchain technology and user awarenessto perform future behaviours [38]. Also, integrated with UTAUT support for the relationship between plan to use Blockchain and traceability [22,23,25]. Venkatesh and Davis [39] are identified and investigate that there is a continuing trend for organizations to evolve from hierarchical structures to more autonomous network equipment.

H6: Intention to use of Blockchain positively impacts the intention to use of Blockchain of using blockchain traceability for food logistics.

4.7. Blockchain Traceability

Blockchain traceabilityrefers to trace and track between industry and food logistics.Blockchain depends on behaviour intention of Blockchain in industries [42]. Also, blockchain traceability is a fundamental of every logistic tracking. Stakeholders within the supply chain depend on each other members of the components or their ability to facilitate operations. Blockchain traceability is particularly unique in the logistic chain.Therefore, blockchain traceability enhances the logistic chain in food industries.

H7: Blockchain traceability depends on the intention to use of Blockchain for food logistics.

5. METHODOLOGY

To test the research model empirically a quantitative method applied, and primary data collected by the online questionnaire (appendix A). A detailed survey used to obtain official data (raw data) from the logistic industry in Malaysia, Blockchain enthusiasts, cryptocurrency and potential Blockchain users worldwide using. The sample size was 374. Partial least square (Smart-PLS) techniques used to analyses the underlying structures.

6. DATA ANALYSIS

SPSS 22 used for data preparation and descriptive analysis, while structural equation modelling (SEM Smart PLS 2) used to do the necessary testing [48]. Throughout the questionnaire preparing stage, both face and content validity were conducted. Secondly, the composite reliability examined (range from 0.939 for BI to 0.975 for BA). Thirdly, the average variance extracted (AVE) has been calculated with AVE values ranged between 0.734 and 0.930 the condition of value higher than 0.5 was fully met discriminate Validity: To make sure that the measures are more related to their own respective construct, the square root of AVE examined and confirmed the discriminate validity of the outer model [79]. Lastly, construct validity established in this study by confirming content validity, convergent validity, and discriminate validity.

7. RESULTS

Factor Analysis

Kaiser-Meyer-Olkin (KMO) is a testing process where we can see the variable are fit in the model or not. If the KMO is upper than 0.6, then the model is significant, and variables are adjusted in the model. KMO values below 0.6 suggest sampling is not sufficient and remedial action should be taken.

Table 1: Reliability of Instruments

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	15573.094
	df	378
	Sig.	.000

Reliability

The value of Cronbach's alpha (α) must equal to or greater than 0.7 for all scales (Nunnally, 1978). The results of the reliability test show that all values exceed 0.7. Therefore, it shows that all the elements are reliable to measure the opinion of the respondents.

Table 2

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.772	28

Table 3

Item-Total Statistics				
	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Cronbach's Alpha if Item Deleted**
PE1	116.62	101.595	.321	.764
PE2	116.53	104.598	.209	.770
PE3	116.60	105.007	.173	.772
PE4	116.55	104.309	.216	.769
EE1	116.44	105.555	.182	.771
EE2	116.37	107.693	.071	.776
EE3	116.45	107.500	.073	.776
EE4	116.51	106.720	.120	.774
T1	116.63	102.364	.383	.761
T2	116.42	105.108	.208	.769
T3	116.53	102.139	.363	.762
T4	116.47	104.058	.252	.767
FC1	116.86	100.386	.333	.763
FC2	116.76	97.660	.429	.757
FC3	116.64	101.877	.321	.764
FC4	116.73	100.538	.299	.766
SI1	116.50	105.756	.162	.772
SI2	116.57	100.443	.396	.760
SI3	116.64	102.787	.262	.767
SI4	116.52	106.175	.103	.777
Ib1	116.41	98.728	.527	.753
Ib2	116.23	104.076	.263	.767
Ib3	116.59	100.632	.454	.758
Ib4	116.53	101.957	.430	.760
bt1	116.46	99.653	.480	.756
bt2	116.29	104.143	.257	.767
bt3	116.55	100.683	.445	.758
bt4	116.52	102.043	.424	.760

8. DISCUSSIONS

Blockchain is known as a digital tracking system to do a transparent supply chain. It is a distributed, open-source, decentralized database for storing transaction information. Instead of relying on central brokers (for example, labels, RFID), this technique allows two parties to deal directly with the associated redundant ledgers called block through the exact source of the product to the consumer.In this study, we used UTAUT2 to constructa theoretical framework. It is presumed that the main factor driving technology adoption is the usefulness of the systems. This is compatible with the related technology acceptance frameworks[43]. Participates more and more in making decisions related to the application of technology. About security, risk and safety, the Blockchain plays an important role. Besides that, the Blockchain constructs a secure channel to detect product source and its expiry date to store and distribute it to the consumer.

9. IMPLICATIONS FOR PRACTICE

Throughout the coming years, demand for accountability will continue to grow in the supply chain. The customer perceptions about product properties will increase and companies will want to check the claims for high value products like collectibles, medicines and food. Many companies, particularly multinationals, need an effective, transparent supply chain from many suppliers. Supply chain or traceability view feature. Once food items are recovered, however, it may definitely be important to know the source of the raw materials.

Through providing a secure way to track commodity properties and processes, Blockchain helps businesses assess and reduce supply chain risks. This is more significant than the fact that consumers are profoundly concerned about human rights, food health and environmental sustainability. Blockchain's ability for practical use, including monitoring, authentication and protection. Blockchain technology provides a chance for new supply channel for competitive advantages. Objective evidence can be a big benefit in the logistic food chain to support these statements.

10. CONCLUSIONS

It is challenging or even impossible to run the traditional supply chain in companies.Nonetheless, this problem can be overcome by Blockchain. The new technology introduces a consistency standard in the food supply chain, allowing supply chain managers to access the knowledge that customers need, thus adding to their company's competitive advantages. New technology development and deployment ensure its effectiveness. An innovative vision is required to better understand the underlying opportunities and challenges that will push companies to implement blockchain technology to track the supply chain. Earlier research had shown how important Blockchain was to be used. The aim and its predecessors also affect technical use. This article provides a coherent theory of technical acceptance and usage (UTAUT) to broaden the understanding of obtaining the technology from end-users. This theory provides a rigorous foundation for the creation of blockchain tools to clarify this relationship. By doing this, investigationbehaviour theory is presented as a lens to understand blockchain dependence on the screen.The theoretical model is derived possible framework to understand and adopt Blockchain for logistic food chain tracking. The proposed model is supported by scalable and balanced proposals with implications for the future management of the supply chain.

APPENDIX A

Table A1: Survey Items.

Variables	Items	Adapted from
Performance Expectancy	Blockchain in food logistic chain useful in my daily life	Venkatesh et al. (2012).
	Blockchain in food logistic chain increases my chances of achieving things that are important to me	Mahadi et al. (2020).
	Blockchain in food logistic chain helps me accomplish things more quickly	
	Blockchain in food logistic chain increases my productivity	
Effort Expectancy	Learning how to use Blockchain in food logistic chain is smooth for me.	Venkatesh et al. (2012).
	My interaction with Blockchain in food logistic chain is clear and understandable.	Mahadi et al. (2020).
	I find Blockchain in food logistic chain easy to use.	
	It is easy for me to become skilful at using Blockchain in food logistic chain	
Trust	I trust on Blockchain in food logistic chain	Gefen et al. (2003)
	I depend on Blockchain in food logistic chain	
	I do not doubt the honesty of Blockchain in food logistic chain	Mahadi et al. (2020).
	I feel assured that legal and technological structures adequately protect me from problems on Blockchain in food logistic chain	
Facilitating Condition	I have the resources necessary to use Blockchain in food logistic chain	Mahadi et al. (2020).
	I have the knowledge necessary to use Blockchain in food logistic chain	Venkatesh et al. (2012).
	Blockchain in food logistic chain is compatible with other technologies I use.	
	I can get help from others when I have difficulties using Blockchain in food logistic chain	
Social Influence	People who are important to me think that I should use Blockchain in food logistic chain	Venkatesh et al. (2012).
	People who influence my behaviour think that I should use Blockchain in food logistic chain.	Mahadi et al. (2020).
	People whose opinions that I value prefer that I use Blockchain in food logistic chain	
	People who are close to me think that I should use Blockchain in food logistic chain	
Intention to Use of Blockchain	I intend to continue using Blockchain in food logistic chain in the future	Mahadi et al. (2020).
	I will always try to use Blockchain in food logistic chain in my daily life	
	I plan to continue to use Blockchain in food logistic chain	
	I am fascinated to use Blockchain in food logistic chain	
Blockchain Traceability	I believe blockchain-enabled E-traceability in food logistic chain.	(Brown et al., 2010; Maruping et al., 2017)
	I believe supply chain stakeholders will provide me with in-depth access to how blockchain-enabled E-traceability of the logistic food chain	Mahadi et al. (2020).
	I believe supply chain stakeholders will provide me with in-depth knowledge about applications of Blockchain in E-traceable of the logistic food chain	
	I believe I will have opportunities to provide feedback on blockchain-enabled E-traceable of the logistic food chain.	

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