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Factors Affecting the Application of Block Chain Technology in Flower Supply Chain Management in Vietnam

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Abstract
The study's primary purpose is to determine the applicability of blockchain technology in flower supply chain management in Vietnam based on the review process results and to consolidate the theoretical basis of this technology. The authors collected data from 403 online surveys for subjects working in import and export, international business, e-commerce, and information technology. Then, we analyzed the data with descriptive statistics, Cronbach's Alpha reliability test, and exploratory factor analysis (EFA) using SPSS 26.0 software. The research results show that the flower supply chain has five factors affecting application awareness: Legality, security, usefulness, risk, and traceability. From there, the authors propose several solutions to help businesses increase efficiency and note certain limitations.

Keywords: Block Chain Technology, Flower Supply Chain Management, Vietnam

1. Introduction
Artificial intelligence (AI) technology is gradually becoming a trend with the automation and simplification of daily tasks, helping people save a lot of time, resources, and costs compared to before (Vi *et al*., 2022). In particular, the application of blockchain technology has attracted significant attention in many industries globally; one of the industries where the potential of this technology is being explored is agriculture, especially in supply chain management. Blockchain technology is widely used in the fields of financial services (over 83%) and supply chains (40%) in Vietnam (Nguyen Thi Hai Ha *et al*., 2020) [3]. However, for agricultural supply chains, smart agriculture and intelligent supply chain management are gradually becoming popular in Vietnam, but our country has not yet built a complete digital agricultural model (Nguyen Dang Minh and Nguyen Thu Tram, 2021) [2].
According to Duong Dac Quang Hao's (2023) proposal, raising people's awareness of the application of Blockchain technology in business is essential. When companies and workers realize the benefits of Blockchain, their need to learn and apply technology in general and Blockchain in particular will also be increased. That is why we identify the application of blockchain technology to supply chain management in Vietnam: To equip the research subjects with awareness of this technology and provide management implications for businesses that are applying and will apply this technology shortly.

2. Literature Review
2.1 Definition of Blockchain
Blockchain technology is an advanced database mechanism that enables transparent information sharing within a business network. Blockchain databases store data in blocks that are linked together in a chain. The data is chronologically consistent because you cannot delete or modify the chain without consensus from the network. Therefore, you can use blockchain technology to create an immutable and unchangeable ledger to track orders, payments, accounts, and other transactions. The system has built-in mechanisms to prevent unauthorized transaction entries and create consistency in the overall view of these transactions.
Traditional database technologies pose many challenges in recording financial transactions. Consider, for example, the sale of an asset. Once the money is delivered, asset ownership is transferred to the buyer. The buyer and seller can each record the monetary transaction, but neither source is trustworthy. The seller can easily claim that they have not received the money even if they have, and the buyer can also dispute that they have transferred the money even if they have not paid.

A trusted third party is needed to oversee and authenticate transactions to avoid potential legal issues. The presence of this central authority not only complicates the transaction but also creates a vulnerability. If the central database is compromised, both parties can suffer.

Blockchain mitigates such issues by creating a tamper-proof, decentralized system for recording transactions. In the case of asset transactions, the buyer and seller are each given a separate ledger by the blockchain. Both parties must approve all transactions automatically updated in both ledgers in real-time. Any errors in previous transactions will corrupt the entire ledger. These properties of blockchain technology have led to its use in various fields, including creating digital currencies.

2.2 Blockchain in Supply Chain Management

Using blockchain technology in the agricultural food supply chain, all network nodes' activities are visible, and all information is recorded based on consensus among network members (Criss *et al*., 2020). Blockchain technology increases data validity in the network and reduces the need for a third party to monitor the network to control information (Xie, Sun, & Luo, 2017). Many studies have been conducted on applying blockchain technology (Ronaghi, 2021) [4]. To improve the supply chain's food safety, quality, and traceability. Increased demand and food shortages are causing problems - the leading cause is counterfeit products. Lack of transparency and low efficiency create problems for producers and consumers. Blockchain technology can increase efficiency, transparency, and trust in all agricultural supply chains (Rudoy *et al*., 2021).

2.3 Hypothesis research

Based on the above factors, we can see that Blockchain has many benefits, but it also has many risks associated with applying Blockchain to the supply chain in Vietnam. These risks include being attacked due to technological and operational errors or cyber-attacks (Tue, 2021). The issue of scalability also brings many difficulties (Giao, 2022). In addition, the risk of technology application costs has been confirmed by Lin and Liao (2017) that participants in the agricultural value chain will bear many costs, time for installation and operation, and infrastructure risks because, if not guaranteed, the data running time will be prolonged, leading to a reversal of efficiency (Le, 2018). Mr. Kosba and his colleagues pointed out that Blockchain cannot guarantee transaction privacy because the value of all transactions and the balance for each public key are publicly displayed (Kosba *et al*., 2016).

H1: *Risk hurts blockchain technology application in flower supply chain management in Vietnam.*

All transactions are smartly encrypted and time-locked; users can access and change their ownership only through the private key (Tue, 2021). Trang and Thu (2019) agree that this helps enhance transaction data's integrity and security. Blockchain technology is also applied to build a transparent and secure information mechanism in the process of traceability management (Trang *et al*., 2020). At each transaction in the "Blockchain," users can be identified by their public key or the block code. In addition, data can be retrieved and checked. Therefore, Blockchain technology enhances transparency and security in supply chain management and increases consumer trust (Reyna, Martín *et al*., 2018).

H2: *Security has a positive impact on blockchain technology in managing flower supply chains management in Vietnam.*

A traceability object is defined as a traceable resource unit (TRU) (Albergamo *et al*., 2018), and each supply chain has its own TRU because it depends on the structure of the supply chain itself and national regulations (Mottese *et al*., 2020). Badia-Melisa *et al*. (2020) demonstrate that blockchain technology enhances food safety and quality. Traceability systems increase products' value and profits for businesses (Qian *et al*., 2020). Using Blockchain technology can be trusted and secured to provide information transparency and prevent counterfeiting (Feng, Wang *et al*., 2020). Blockchain-based traceability of plant products improves traceability and sustainable management and increases customer trust and willingness to buy (Feng *et al*., 2020).

H3: *Traceability has a positive impact on blockchain technology applications in flower supply chain management in Vietnam.*

According to Trang *et al*. (2020), the food chain needs to become more sustainable to increase consumer trust and loyalty, which is the key to more reliable and effective traceability. Smart contracts are self-executing codes on the Blockchain that are allowed to be processed directly without manual intervention to perform transactions. By applying blockchain technology, businesses spend much less money than previous methods (Tue, 2021). Therefore, the study proposes the hypothesis:

H4: *Usefulness has a positive impact on blockchain technology in managing flower supply chains management in Vietnam.*

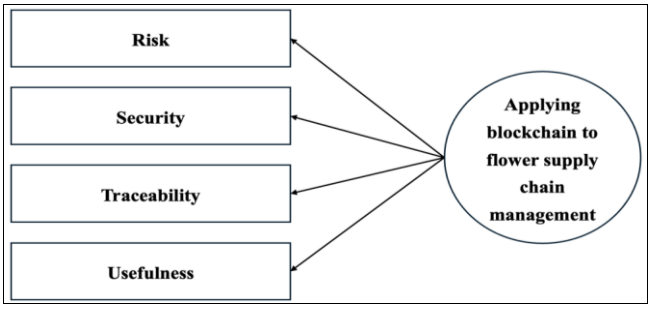

Fig 1: Model Research

3. Methodology

The research method uses 20 observation variables collected through the synthesis of research results of many different authors. The research sample is designed with a minimum of n = 20x5 = 100 to ensure that the survey sample is large enough and reliable. However, the authors used 450 observations to increase the reliability of the research results. After the data screening process, we found that 47 observations were unreliable and removed them. The number of observations included in the analysis is 403 observations.

The observation variables will be collected using a 5-level Likert scale that allows participants to evaluate the reliability of factors related to flower supply chain management in Vietnam. We use "Google Forms" to present the questions. Data collected from the survey will be analyzed and evaluated using descriptive statistics, Cronbach's Alpha reliability testing and exploratory factor analysis (EFA) using SPSS 26.0 software to determine the reliability level and general trends in flower supply chain management in Vietnam.

4. Results

Analyze the scale's reliability by examining Cronbach's Alpha coefficient to eliminate inappropriate variables. According to Nunnally & Burnstein (1994), variables with a total correlation coefficient of less than 0.3 will be eliminated, and the criterion for selecting a scale is when it has an Alpha reliability of 0.6 or higher (Nguyen Dinh Tho and Nguyen Thi Mai Trang, 2008).

Table 1: Results of scale reliability assessment using Cronbach's Alpha

Risk *Cronbach's Alpha = 0.712*			**Security** *Cronbach's Alpha = 0.736*		
R1	0.483	0.624	S1	0,543	0,712
R2	0.490	0.613	S2	0,527	0,789
R3	0.356	0.723	S3	0,426	0,723
R4	0.398	0.695	S4	0,378	0,745
Traceability *Cronbach's Alpha = 0.812*			**Usefulness** *Cronbach's Alpha = 0.798*		
T1	0,348	0,815	U1	0,467	0,743
T2	0,356	0,783	U2	0,455	0,788
T3	0,423	0,834	U3	0,381	0,812
T4	0,411	0,742	U4	0,365	0,792
Applying blockchain to flower supply chain management *Cronbach's Alpha = 0.810*					
A1		0,434	0,803		
A2		0,456	0,815		
A3		0,397	0,765		
A4		0,325	0,832		

According to Garson (2003), the standard for factor analysis is that the KMO index is greater than 0.5, and Barlett's Test has a significance level of Sig < 0.05 to ensure that the data used for factor analysis is appropriate and that the variables are correlated. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value = 0.831. The result of the KMO index analysis is 0.831 > 0.5, which proves that the data used for factor analysis is entirely appropriate. The result of Barlett's test is 2295.609 with a significance level of Sig. = 0.000 < 0.05, at this time, there is enough basis to reject the hypothesis that the observed variables are not correlated with each other in the population. Thus, the variables are associated with each other and satisfy the conditions for factor analysis.

Table 2: Varimax rotation method matrix

	Factors			
	1	**2**	**3**	**4**
R1	0.742			
R3	0.754			
R4	0.789			
R2	0.732			
T1		0,.768		
T4		0.624		
T3		0.784		
T2		0.754		
U4			0.723	
U1			0.791	
U2			0.712	
U3			0.724	
S1				0.731
S2				0.722
S3				0.726
S4				0.745
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.				0.831
Bartlett's Test of Sphericity		Approx. Chi-Square		2295.609
		Sig.		0.000

Regression analysis shows the causal relationship between the dependent variable, "Applying blockchain to flower supply chain management," and four independent variables. The regression results show that the model is relatively suitable, with a significance level of 1%. The coefficient of determination of the adjusted R square regression model is 0.735. This explains about 73.5% of the variation in factors affecting the dependent variable, which the linear relationship between the Y and independent variables can explain. The remaining 26.5% are factors that are not considered. In addition, the results tested the assumption of the linear regression model, including the phenomenon of autocorrelation with the Dutch – Watson coefficient = 1.870 and within the acceptable range 1 < D < 3 (Pride and Ferrel, 1997). The multicollinearity measurement coefficient VIF of the variables is small (the largest is 1.521 < 2). Conclusion: There is no autocorrelation between random errors and the phenomenon of multicollinearity occurring between independent variables in the model is small and does not distort the regression results. Testing the hypothesis of the model's overall fit, we see that the value of F = 119.524 with sig. = 0.000 and less than 0.05. Therefore, the overall R square is different from 0. The linear regression model is suitable overall. The coefficient β shows the level of influence of 4 independent variables on the dependent variable and the importance of each independent variable respectively: Risk has β = 0.232, security (β = 0.136), usefulness has β of 0.168, traceability with β = 0.212. We have the equation:

$$\mathbf{Y = 0,232R + 0,212T + 0,168U + 0,136S}$$

5. Conclusion

The most worrying thing about the perception of application is legality. Blockchain technology is a new technology related to various countries; so far, no common regulation or law has been established, similar to the conclusion of Ho and Bui (2018). Research by Tue (2021) proves that cross-border transactions without strict legal standards cause a situation of unsecured security, and we believe that this will affect domestic producers and consumers. Blockchain technology has a very high level of security when applied to agricultural supply chain management, similar to Tue (2021). Intrusions on traditional information networks will be extremely difficult to conduct with blockchain networks because the entire transaction is encrypted, so the information is extremely highly protected. The potential risks of Blockchain technology include cost risks, privacy risks, storage, expansion, and leakage of information of participating companies, which significantly impact business operations, as Tue (2021) has studied. Through our

research, we have realized similarities with Lin & Liao (2017) regarding the cost issue. Application and installation are always complex problems for businesses that want to invest in this technology, partly because of the high cost of equipment and the need for a large quantity of equipment to operate. In addition, Blockchain technology is also very costly in terms of fuel because it needs to operate continuously to avoid chain breaks and system failures. With the inheritance of the study "Application of Blockchain Technology to Develop Agricultural Supply Chains" by Duong Dac Quang Hao (2023), we see that traceability also makes businesses consider applying it to agricultural supply chain management.

Currently, traceability is being used in agricultural products with positive feedback on improving the quality of flower products, increasing consumer trust and transparency of information and origin, but consumer awareness of this factor is not high.

In terms of usability, Build model projects and real projects. For this solution, businesses can create models and real projects applying blockchain technology in agricultural supply chain management. These projects can be deployed and tested to help users see how blockchain technology can solve problems in agricultural supply chain management. In addition, we can combine creating forums with the participation of experts.

Continue to research and develop Blockchain technology to optimize agricultural supply chain management applications. Apply new technological innovations such as expanding processing capacity, improving transaction speed, and enhancing security to meet the specific requirements of the agricultural industry.

Standardizing processes and data from servers using technology is essential for traceability. Enterprises equip platforms to perform support functions such as information technology, human resources, compliance regulations, and financial resources.

Propose policies and regulations and promote the creation of guidelines and rules for applying blockchain technology in agricultural supply chain management. This may include compliance with and promotion of rules and standards for using technology in agricultural supply chain management. At the same time, legal aspects should be considered, rights should be protected, and information security should be ensured when using this technology.

It is necessary to review and standardize specific processes. It is possible to divide the process into each for easier management, thereby controlling loopholes in the transaction process. Periodically maintain, supplement, and upgrade the system to increase its life span. Regarding the cost issue, it is possible to consider calling for investment in this new technology because Blockchain is currently a technology that leads to new trends and has high prospects in the future.

In addition, it is necessary to consider the ethical and social responsibility aspects in applying Blockchain technology in agricultural supply chain management to ensure that this technology not only creates economic benefits but also meets the criteria of sustainability and environmental protection and ensures the rights of the people.

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