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Assess the Impact of Blockchain Application in Electronic Commerce on Customer's Shopping Experience

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Abstract:

Technology is increasingly disruptive, and economic transformation according to technology development is inevitable. Especially the field of E-commerce is constantly catching up with that development. We can easily see the development and importance of e-commerce in Vietnam and worldwide after the Covid-19 pandemic. Therefore, to attract and get customers online, businesses need to come up with solutions to increase the customer experience when shopping for their products. And the solution to this problem is the application of blockchain technology (blockchain) to e-commerce. Customer experience when shopping on e-commerce platforms with blockchain application is influenced by factors such as perceived risk, security, transparency, information synchronization, cost savings. To carry out this research, the research team conducted a survey and analysis based on 402 most suitable survey questionnaires, then conducted an assessment of factors affecting the shopping experience of customers when applying blockchain to e-commerce using Smart PLS 4.0 software and SPSS software. The survey was conducted with customers who have experience buying on e-commerce. The results of this research paper are a premise for many other future studies related to blockchain technology and draw out the governance implications for Vietnamese businesses in improving the shopping experience of customers when applying blockchain technology to e-commerce. In addition, the research results also help shoppers access the benefits of blockchain technology, helping customers feel more secure and confident when buying on e-commerce.

Keywords: blockchain, security, transparency, synchronicity, perceived risk.

JEL Classification: L81, M15, O33, D83, L86.

Introduction

The era of technology is constantly developing, and the needs of human life are increasing. With all the constant development of the world of technology, the ultimate goal is to bring more value and convenience to people. One proof of this is the need for human use and the development of the e-commerce sector. One of the significant turning points for us to realize the importance of e-commerce is the time of the COVID-19 pandemic (2019-2022). E-commerce has been increasingly changing consumer behaviour. Furthermore, consumers also promote the development of technology.

According to Google's 2022 report on e-commerce, Southeast Asia has brought positive values to the region's development. Vietnam is one of the countries that will lead the trend of digital e-commerce development. The report also shows that by 2022, Vietnam's e-commerce economy will reach 23 billion USD and is expected to reach 50 billion USD by 2025; by 2030, our country's digital economy will reach 120-200 billion USD. Vietnam is also considered the fastest-growing market in the region, thanks to the booming e-commerce sector. However, many surveys show that when shopping on e-commerce platforms, consumers may face many risks, such as poor-quality goods, products not as described, slow delivery, damaged goods, and non-delivery. There are also cases of personal information being exposed after online purchases. Although e-commerce is growing, the above risks have and will negatively affect the customer shopping experience. To address potential risks affecting customer experience, many businesses worldwide and in Vietnam have sought ways to prevent risks and improve customer experience. Blockchain is one of the solutions that many businesses worldwide trust and use.

In Vietnam, blockchain technology is not just a concept but a reality applied in many fields, such as banking, finance, healthcare, and education. Vietnam is a bright spot on the world blockchain map, with many companies making their mark. Out of 200 blockchain companies worldwide, seven have a capitalization of over 100 million USD, and Vietnam is home to some of them. Statistics from Infinity Blockchain Labs show that blockchain technology is being applied more and more widely in Vietnam. Specifically, public services account for nearly 30%, agricultural/food/commodity supply chains account for nearly 40%, and the financial sector accounts for more than 83%. Many large enterprises in Vietnam, such as Viettel and TMA Solution, have plans to deploy blockchain technology in existing business areas. Economists have also predicted that Vietnam's blockchain will grow by double digits from 2023-2027, further solidifying Vietnam's position as a key player in the blockchain revolution.

Previous studies have primarily focused on the perspective of combining single models. Many combined models have emerged; this integrated multi-model approach provides a more comprehensive view of the factors affecting blockchain adoption, overcoming the limitations of using only a single model (Alazab et al., 2020). While most previous studies have focused on adopting blockchain technology, Hubenova et al. (2024) focus on non-adoption, providing a new perspective on the barriers and challenges associated with implementing this technology. Part of these challenges come from the negative user experience flow. In addition to the significant side effects, blockchain has the potential to shake up the foundations of e-commerce by enabling thrustless exchange relationships and operating without the need for dedicated intermediaries or even central authorities in the case of permissionless blockchains (Treiblmaier & Sillaber, 2021). According to Esfahbodi et al. (2022), while many previous studies on blockchain adoption focused on the organizational level, future studies should apply to individual consumers, providing a new perspective on the platform at the micro level. Based on these research gaps, the research team has developed a set of criteria to assess the impact of blockchain applications in e-commerce on customer shopping experience. These criteria aim to identify factors influencing customer shopping experience when applying blockchain technology, develop research, and collect data. By following these criteria, businesses can adjust and apply blockchain technology to ensure customers have a better shopping experience at booths on e-commerce platforms.

1. Literature Review

Blockchain is defined as a distributed ledger technology that can record transactions between parties in a secure and long-term manner. By "sharing" which allows data to be exchanged directly between different parties in a network, the blockchain essentially eliminates the transaction verification of a middleman who understands better than a 3rd party (e.g., a bank). Blockchain has facilitated from a central point to a distributed system that effectively releases data that was previously stored at the data warehouse (Kuckelhaus et al., 2018). As Nakamoto's research (2008) shows: Blockchain appeared in 2008 as a peer-to-peer encrypted electronic money system, recording transactions and allowing network users to be distributed in different places to exchange information. Although they started as Bitcoin (cryptocurrency), they have recently moved into and expanded in the field of e-commerce.

Also, recent studies have shown that Bitcoin's volatility remains high across various metrics, including historical, forecasted, and implied volatility (Chinazzo & Jeleskovic, 2024). With the powerful capabilities of blockchain have helped e-commerce develop in a breakthrough way (Treiblmaier & Sillaber, 2021).

Security

The development of e-commerce is increasing, along with the increasingly fierce competition in the current market. The invention of blockchain has changed every landscape in e-commerce. Not only that, blockchain has been proven in terms of benefits for the e-commerce industry in theory. According to the research results of Sheth & Subramanian (2019) indicating that: The blockchain-based market has many advantages over the current market, such as the combination of keeping buyers and sellers, the right of customers' private information protected, and reliable tracking of delivery information. Blockchain applications in e-commerce can help protect the privacy and security of customer data information. Research by Sicari et al. (2015) shows that: The e-commerce process involves big data, and the biggest risk is information leakage and data tampering. During regular use, users are not aware that their information is being leaked and used, which leads to harm to customer privacy (Zhang et al., 2020). However, blockchain applications will solve this problem. New transaction methods on blockchain, smart contracts, and electronic payments can ensure data safety and create trust for transaction participants. Although there are still vulnerabilities and system risks such as hacker domain attacks, and user credentials (Li et al., 2020), according to current research, the use of blockchain can bring assurance and improve the security of users' data.

H1: Security impacts customer experience

H2: Security affects perceived risk

Perceived risk

When using e-commerce to transact and sell products, users are often afraid of unexpected risks. According to research by Aljukhadar et al. (2010) identified the risks that users often encounter that are the security features of each website. Along with that, research by Ramesh et al. (2017) and Zhang et al. (2014) has shown that: Fraudulent schemes to steal personal and confidential information such as phishing websites have detrimentally also cast doubt on the safety of e-commerce. A proposed solution to improve the quality and limit possible risks. As research by Halpin & Piekarska (2017) and Kethineni et al. (2018) has shown that the application of blockchain technology and enhancement of smart contracts in e-commerce, questions arise regarding secure implementation, fair enforcement of secure exchanges with other systems, and privacy. Blockchain technology is implemented according to the consensus mechanism and stored according to the blockchain, other systems, and privacy. Blockchain technology has been implemented through a sophisticated consensus mechanism, on-chain storage, and verification and signatures, enabling a plethora of new features. These include all features such as consistency, anti-tampering, distributed denial of service (DDoS) protection, and from other attacks according. It also integrates privacy protection plans in the cases where sensors are used. From the above features, users can be assured of the risks when buying on the e-commerce platform.

H3: Perceived risk affecting customer experience

Synchronicity

According to the research results of Wan et al., 2022 blockchain data is stored consistently, creating a reliable and tamper-proof permanent record. As for the problem of fake reviews, online reviews of the platform can be tailored based on the blockchain distributed ledger and the possibility of information tampering. Starting from the problem of coordinated decision-making, synchronous decision-making among supply chain members can be managed through blockchain terminal management technology. As a result, integrating blockchain technology and online consumer reviews can handle false reviews more efficiently. Also, the study by Treiblmaier & Sillaber (2021) is as follows: Systems in the blockchain do not have a central authority by design, and participants themselves add new items to the shared data structure. New items received that have not yet been included in the blockchain will be forwarded to other participants and continuously transmitted through the system. To keep all copies of the blockchain consistent, participants need to reach a consensus on the state of the chain through a decentralized majority voting process. E-commerce transactions conducted through the blockchain store purchase-related data in an orderly and immutable manner, which improves the provenance and traceability of the data, depending on the technical implementation of the blockchain system.

H4: Synchronicity affects customer experience

Transparency

One of the advantages that blockchain brings when applied to e-commerce is transparency. Many previous studies are confirming and giving a lot of evidence proving transparency when applying blockchain. Here are a few studies related to transparency. Research by authors Melkić & Čavlek (2021) indicates that blockchain can increase the efficiency and transparency of supply chains. In addition, it also positively affects every process from warehousing and delivery to customer payment. Blockchain technology ensures consensus, there are no conflicts in the transaction chain because all entities in the chain have the same version of the ledger. In this research paper, authors Melkić & Čavlek (2021) also pointed out that it is important to implement blockchain transparency so that records in the blockchain cannot be deleted.

The use of blockchain technology also provides visibility, reducing costs and associated risks in the supply chain. The benefits that blockchain brings include increased monitoring of the supply chain of materials to help ensure parties comply with set standards; and minimize losses associated with illegal products. This increases transparency, obliging parties to comply when trading. Blockchain technology can promote transparency in the supply chain, reducing the risk of fraud on high-value goods such as diamonds or pharmaceuticals. Blockchain can help companies understand how individual components and finished products pass through each subcontractor, reduce revenue losses due to counterfeiting and illegal goods, and increase end-user trust by reducing or eliminating the negative consequences associated with counterfeit products. Blockchain can provide a highly efficient electronic environment in which all data will remain unchanged for years to come.

Besides, according to the research of Wan et al. (2022), it is also stated as follows: Blockchain technology can solve the problems of data tracking and anti-falsification of information in the supply chain and improve the authenticity and transparency of information. As more consumers actively share product information and service experiences, the number of online consumer reviews has grown exponentially, and this scale offers significant advantages for blockchain technology integration and online consumer reviews. BOCR technology realizes the authenticity of online consumer reviews through blockchain technology, thus providing information services to manufacturers, e-commerce platforms, and consumers.

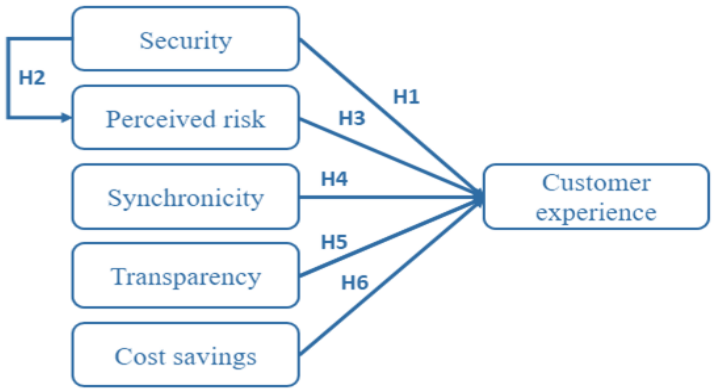
H5: Transparency affects customer experience

Cost savings

According to research by Esfahbodi et al. (2022), cost is one of the key factors that directly determine whether consumers are willing to pay for the product they want to buy. In addition, in the research of Chong et al. (2017), it was mentioned that everyday search engines on e-commerce platforms must handle millions of customer queries. Processing those queries requires consistent and efficient technology to save costs when using. To solve this problem, the application of blockchain technology is the right choice for e-commerce businesses. In addition, blockchain technology eliminates dependence on third parties and has better security mechanisms that can prevent fake or malicious data (Yue et al., 2017). Blockchain also allows businesses to cooperate without having to establish a long-term relationship, which helps businesses reduce some costs in negotiation (Melkić & Čavlek, 2021). At the same time, Kim et al., 2020 concluded that cost savings will affect customers' buying intent. Accordingly, consumers will realize the benefits of saving costs and having a better shopping experience.

H6: Cost savings affect customer experience.

Figure 1. The proposed research model



2. Research Methodology

The research process is carried out by two methods: qualitative research and quantitative research. Qualitative research aims to learn, refine, supplement and complete questionnaires. This study was carried out in 2 phases:

- Phase 1: Research the theoretical basis from which to build models and scales.
- Phase 2: Using qualitative methods and group discussions to identify factors influencing purchase intent on e-commerce platforms in Ho Chi Minh City. Next, learn about the concepts of intent, risk perception, and data synchronicity. From there, complete the construction for the proposed author group model.

Research conducted with samples to estimate customers' online purchase intent through survey questionnaires adapted from group discussions to collect and analyse survey data. The questionnaire focused on a group of clients living in Ho Chi Minh City. After conducting the discussion, the group comes up with survey questions. Then continue to analyse, remove and explain confusing terms for customers to understand and survey more accurately. After that, the team conducted a formal survey in the amount of 400 samples. The actual number of questionnaires the actual group received was 425 samples. Of which 402 samples are valid.

3. Research Results

3.1. Descriptive Statistical Analysis of Demographic Variables

The survey results showed that most of the survey participants were between the ages of 19 and 25 years old, this group accounted for 61.9%; followed by 16- to 18-year-old accounting for 19.9%; over 25 years old accounted for 18.2%. The survey participation rate between men and women is almost equal with 50.2% being female and 49.8% being male. The survey results show that most of the survey participants are currently students, this group accounts for 46.3%; followed by office workers accounting for 34.3%; Workers accounted for 16.2% and 3.2% of the target group in other occupations. The research results summarized show that 57.2% of survey participants only use 1 method when paying; 22.1% applied 2 methods when paying and 20.6% applied all 3 methods when paying.

Table 1. Sample distribution

Demographic variables		Amount	%
Age	16 to 18	80	19,9
	19 to 25	249	61,9
	Over 25	73	18,2
Gender	Female	202	50.2
	Male	200	49.8
Occupation	Office staff	138	34.3
	Students/students	186	46.3
	Worker	65	16.2
	Different	13	3.2
Payment methods	E-wallets	52	12.9
	Bank cards	55	13.7
	Cash	123	30.6
	E-wallets, bank cards	9	2.2
	E-wallets, cash	19	4.7
	Bank cards, cash	61	15.2
	Bank cards, e-wallets, cash	83	20.6
TOTAL		402	100.0

3.2. Structural Equation Model Analysis (SEM)

Measurement model

Table 2 is Cronbach's Alpha index results of the variables in the study model. The Cronbach's alpha index was compared by the team to 0.7, meaning that if the Cronbach's alpha index >= 0.7, then the variables studied met the criteria and were statistically significant. As the results in Table 2 show, the variables of the scale all have a Cronbach's alpha index of > 0.7, the highest Cronbach's alpha value is CS (0.849) and the lowest is CE (0.741). So, the proposed factors S, PR, Syn, T, CS, CE are all statistically significant.

Outer loading is the correlation coefficient between an observed variable and a latent variable. To assess the quality of the observed variable, the study used the results of the external load factor of the observed variables to evaluate. In the view of Hair et al. (2014), the observed variable is evaluated as quality when the external load factor >= 0.7. Based on the results of the above table, all observed variables satisfy the condition (> 0.7) that qualitatively and explain more than 50% of the variability of the observed variable.

To evaluate the convergence of the scale, the authors will rely on the mean variance index (AVE) to evaluate. According to Hair et al. (2021) to evaluate the scale of good convergence, the AVE value >= 0.5, this means that the underlying variable will explain more than half of the variance of its observed variables. Based on the results of the table above, the AVE values of the variables all satisfy the condition (> 0.5) and the scale meets the convergence requirement.

Table 2. Cronbach's Alpha, AVE, Outer Loadings

Proposed factors	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	Outer Loadings
CS	0.849	0.896	0.684	0.800 – 0.851
CE	0.741	0.854	0.662	0.730 – 0.861
PR	0.814	0.890	0.729	0.822 – 0.881
S	0.840	0.893	0.677	0.759 – 0.868
Syn	0.821	0.893	0.735	0.807 – 0.888
T	0.796	0.880	0.711	0.745 – 0.891

To evaluate the distinguishing value of the scale, the authors used Fornell and Larcker tables introduced by the 2 authors in 1981 and used extensively in research papers and dissertations at many levels up to now. This evaluation method is based on the comparison of the square root coefficient AVE (SQRT(AVE)), each latent variable is greater than all the correlation coefficients between those latent variables and other latent variables, the scale is evaluated as having a distinguishing value. Based on the results from the Table 3, the SQRT(AVE) coefficient of the latent variables: cost savings (= 0.827); customer experience (= 0.814); perceived risk (= 0.823); security (= 0.823); synchronism (= 0.858); transparency (= 0.8243), are greater than the correlation coefficients between those latent variables and other latent variables. Therefore, the scale satisfies the condition and is evaluated as having a distinguishing value.

Table 3. Discriminant - Fornell - Larcker criterion

Variables	Cost Savings	Customer Experience	Perceived Risk	Security	Synchronism	Transparency
Cost Savings	0.827					
Customer Experience	0.652	0.814				
Perceived Risk	0.658	0.671	0.854			
Security	0.690	0.712	0.603	0.823		
Synchronism	0.651	0.612	0.560	0.606	0.858	
Transparency	0.652	0.658	0.523	0.629	0.477	0.843

Structural model

For the purpose of testing whether the underlying variables in the paper showed linear multi-addictiveness, the team used the value of VIF's results. According to Hair et al. (2019), the threshold for evaluating the VIF index is as follows: VIF >= 5 (There is a very high probability of multi-proliferation); 3 =< VIF < 5 (Multilinear multi-additive may occur); VIF < 3 (Multilinear multiplication may not occur). Based on the results obtained from Table 4, the Inner VIF values of all variables have a value of < 3, so there is no linear multi-additive phenomenon in this research model.

Table 4. VIF coefficient table

	VIF		VIF
S-> CE	2.488	Syn -> CE	1.948
S-> PR	1.000	T-> CE	1.783
PR-> CE	2.005	CS -> CE	2.604

R Square evaluates the degree of influence of the independent variable on the dependent variable. As shown in Table 5, the R Square Adjusted index of PR = 0.363 2 is obtained, which means that variable S explains the variation in variance of the PR variable by 36.3%. The remaining 63.7% depends on other random errors and variables outside the study model. Similar to the R Square Adjusted result of CE = 0.669 2, the variables (S, PR, Syn, T, CS) that explain the variance of the variance of the CE variable are 66.9%. The residual effect (33.1%) depended on other random errors and variables outside the study model.

Table 5. R Square and R Square adjusted

	R Square	R Square Adjusted
Perceived Risk	0.364	0.363
Customer Experience	0.673	0.669

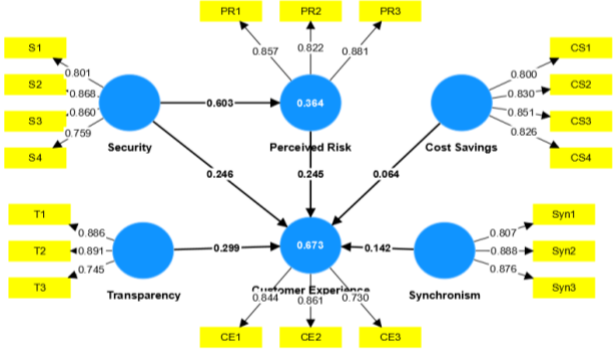
The value of f-Square accurately explains the effect of the strong or weak independent variable on the dependent variable. Based on the results obtained as shown on Table 6, it is shown that: the CS variable has no impact on CE; variables PR, S, Syn, have an average impact on CE; the T-variable has a great impact on CE; and the S variable has a strong impact on PR.

Table 6. f Square

Variables	CS	CE	PR	S	Syn	T
CS		0.005				
CE						
PR		0.092				
S		0.074	0.573			
Syn		0.031				
T		0.153				

Model result diagram

Figure 2. PLS-SEM results for measurement models



Bootstrapping

To check if the path coefficient is significantly different from 0, the t-values value is calculated through bootrapping. In this study, non-technical nonparametric bootrapping was tested for 402 observations and 5,000 iterations to ensure model validation of the linear structure. Results from 5,000 observations from the Table 7 show that the initial weight is significant to the average weighting of bootrapping because all weights are within a 95% confidence range. Therefore, the estimates in the model can be concluded to be reliable.

Table 7. Structural model bootstrapping results

	Original Sample (O)	Sample Mean (M)	Bias	2.5%	97.5%
Cost Savings -> Customer Experience	0.064	0.064	0.000	-0.041	0.170
Perceived Risk -> Customer Experience	0.245	0.246	0.001	0.138	0.350
Security -> Customer Experience	0.246	0.245	-0.001	0.142	0.351
Security -> Perceived Risk	0.603	0.606	0.002	0.514	0.679
Synchronism -> Customer Experience	0.142	0.141	-0.001	0.050	0.236
Transparency -> Customer Experience	0.299	0.300	0.000	0.215	0.381

To assess the impact relationship between variables in the model, the team used the results of bootrapping analysis, two indicators of interest: Original Sample and P Values (P Values < 0.05: statistically significant variable) Based on the results from table 8, it shows that:

The P Values of the H6 hypothesis = 0.225 (0.225 > 0.05), so the impact relationship between CS and CE is negligible (not statistically significant). In addition to the H6 hypothesis, all the other hypotheses have P Values of < 0.05, so the interaction between the other variables is statistically significant.

In terms of the results of the Original Sample index, CE is influenced by 4 variables: S, PR, Syn, T. The normalized regression coefficients of the variables are 0.246, 0.245, 0.142, 0.299, respectively. Therefore, the impact of the variables on CE from strong to weak is T, S, PR and finally Syn. Besides, PR is only affected by the S-variable with a normalized regression coefficient of 0.603.

Table 8. Hypothesis testing result

Hypothesis	Relationships	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Result
H1	S-> CE	0.246	0.245	0.053	4.597	0.000	Accepted
H2	S-> PR	0.603	0.606	0.042	14.323	0.000	Accepted
H3	PR-> CE	0.245	0.246	0.054	4.507	0.000	Accepted
H4	Syn -> CE	0.142	0.141	0.048	2.978	0.003	Accepted
H5	T-> CE	0.299	0.300	0.043	6.981	0.000	Accepted
H6	CS -> CE	0.064	0.064	0.053	1.214	0.225	Rejected

4. Discussion

This study aims to examine the impacts of the application of blockchain technology in the field of e - commerce on the shopping experience of customers. The research model is presented under a framework to assess the impact of blockchain application in e-commerce on the customer shopping experience.

The initial research model shows that customer experience (CE) is influenced by five hypotheses: S, PR, Syn, T, CS (H1, H3, H4, H5, H6). However, the results after the study showed that 4 hypotheses (H1, H3, H4, H5) were accepted and H6 was rejected. Research shows that the security (S), perceived risk (PR), synchronism (S), transparency (T) hypotheses all have an effect on customer experience (CE). These factors increase the shopping experience of customers when applying blockchain technology in e-commerce.

The study results have similar results to the studies: (Wan et al., 2022) The use of blockchain technology in e-commerce increases transparency and accuracy with respect to customer data; (Wang et al., 2021) blockchain application in e-commerce helps services improve well, customer trust increases, thereby helping customer experience for services and products of businesses be enhanced.

When it comes to the implementation of blockchain, research indicates the customer's response to Blockchain technology in online shopping. Customer interest in Blockchain is quite high, as evidenced by the test results: Two influencing factors for the adoption of blockchain are Transparency (0.299) and Security (0.246). For e-commerce, blockchain can be an effective tool to ensure transparency and a high level of trust for users in their purchases. Implementing Blockchain will create practical incentives when building new mechanisms for interaction among functions, principles in e-commerce. According to Hooper (2018), to alter a transaction record, blockchain requires altering all subsequent records, along with consensus from the entire network. For these reasons, data on the blockchain achieves a high level of accuracy, consistency, and transparency.

At the same time, blockchain technology contributes to ensuring data privacy and security for e-commerce platforms. Blockchain technology enhances the e-commerce industry by providing a more transparent and efficient system that allows entities within the same supply chain to verify the identity of trustworthy customers and provide the highest level of security for customer databases and CRM systems. Although blockchain technology promises very high efficiency and cost reduction in today's era, it cannot avoid certain inherent risks. Businesses are required to understand these risks and prepare appropriate protective measures to reap the benefits of this technology.

For perceived risk (T) is influenced by the security hypothesis (H2). The results also show that the H2 hypothesis is accepted. Therefore, the higher the S hypothesis, the more the perceived risk factor increases, thereby helping the customer experience increase. This result is also consistent with research by Esfahbodi et al. (2022), which showed that security positively affects customers' intentions to use blockchain in e-commerce shopping. Therefore, the study confirms the generality and assesses the factors affecting customer experience when applying blockchain to e-commerce in the Vietnamese market.

Conclusion

E-commerce platforms are becoming more and more popular with many consumers. For customers to have a comfortable buying experience, businesses need to improve sales processes as well as apply advanced technologies. The application of blockchain technology is a breakthrough for businesses. Not only is it cost-effective, but it also has other uses to help users trust and have a comfortable experience. The study was completed from statistical steps describing and verifying PLS-SEM linear structure through SmartPLS4 software. Since then, the team has obtained research results that meet the group's main goal of “Assess the impact of blockchain application in e-commerce on customers' shopping experience”. The factors identified are based on previous research papers such as: security, perceived risk, synchronization, confidentiality and cost savings. By testing the SEM model, the research team determined the impact of each factor and arranged it in order from high to low as follows: transparency (T), perceived risk (PR), security (S), cost savings (CS) without impact on customer experience (CE). Besides, confidentiality (S) strongly impacts perceived risk (PR).

Transparency is the factor that most influences a consumer's buying experience. Because they ensure transparency in the transaction process: With blockchain technology, transactions are recorded transparently and cannot be modified. This helps ensure transparency for the parties involved in the transaction process, thereby increasing the reliability of transactions on the e-commerce platform. Utilize open-source blockchain platforms to uphold transparency. Open-source coding enables the community to review the source code and validate the system's accuracy. Implement smart contracts for conducting e-commerce transactions. These contracts can be accessed publicly on the blockchain, allowing all involved parties to examine and confirm transaction terms. Employ digital identity verification solutions, such as blockchain, to ensure authentication for all transaction participants. Additionally, manage access rights rigorously based on roles and responsibilities. When executing transactions, make use of the public ledger feature on the blockchain to record crucial transaction details. This facilitates the creation of a transparent transaction history that can be verified by everyone.

To enhance the security of blockchain in e-commerce, businesses should: Ensure that all blockchain nodes within the e-commerce system are connected through a virtual private network (VPN) to protect data from unauthorized access from external sources. Utilize efficient key management and digital signatures to ensure data integrity and verify the origin of transactions. Continuously monitor the system to detect and address security vulnerabilities. Always keep the blockchain version and related applications up to date to ensure you are using the most secure versions. Synchronicity is also a factor that affects a customer's shopping experience. It is necessary to establish synchronization so that businesses as well as customers can track where their orders have been shipped. This will help customers be more proactive about their orders. Choosing Blockchain application in the business of businesses, it is a good solution that brings many benefits. In addition, the innovation in the e-commerce model thanks to the application of blockchain has been explained and given solutions for e-commerce logistics, payment, data flow and synchronization from difficult to the business on trading platforms are developed and more stable This research paper shows how perceived risks affect the customer buying experience. This shows that

when buying products and services on the Internet, customers are always worried by factors such as information, purchase history, account number.... his 3rd party exposed. But when using blockchain applications, these factors are minimized quickly. To complete this research paper, we tried our best to have the best possible outcome.

However, errors and incompleteness are inevitable. After having completed the research, we noticed a limitation. First, we only focus on understanding the influence of factors on customers and only the personal opinion of each customer. In fact, these factors can also affect the business and there are many other factors that have not been mentioned and studied such as ease of use, usefulness, satisfaction. The second is that in terms of data processing methods, the data analysis in this research paper only uses SmartPLS software. SPSS software is used only for demographic descriptive statistics. The third limitation in this study is that exploratory factor analysis, correlation analysis and linear regression methods have not been used to verify the reliability of scales. The fourth limitation is that research is only practical at the present time, which in the future may no longer be relevant. Finally, the number of samples collected by the research team is small and the age of participation is mainly concentrated from 19 to 25 years old, so this can limit the representativeness of the population. Thereby, we have self-reviewed and proposed some methods to learn from experience such as: carefully considering, referencing more previous research articles with related topics, improving more knowledge and skills necessary to complete the research in the best way.

Credit Authorship Contribution Statement

All authors have contributed significantly to the completion of this work. Giang, N.T.P., was responsible for conceptualization, methodology, writing the original draft, data curation, and formal analysis. Tan, T.D. contributed through investigation, resources, writing review and editing, visualization, and supervision. Duy, N.B.P. focused on software, validation, data curation, formal analysis, and visualization. Hung, L.H. was involved in project administration, resources, and investigation. Tran, C.H. contributed to writing review and editing, and project administration. All authors have read and approved the final version of the manuscript.

Conflict of Interest Statement

The authors declare that the research was conducted without any commercial or financial relationships that could be construed as potential conflicts of interest.

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