EXAMINING THE IMPACT OF TRUST ON CUSTOMER INTENTION TO USE METAVERSE PAYMENTS: A NEXT-GEN TRANSACTIONS STRATEGIC OUTLOOK

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Abstract

The emergence of the metaverse has prompted the growth of payment platforms to keep pace with virtual trends. This study seeks to identify the cognitive factors that influence customer beliefs regarding the adoption of the new payment method, metaverse payment, which refers to financial transactions conducted within virtual environments, often facilitated by digital currencies or blockchain technology. The study examines customers by conducting an online survey on the Google platform. The data were gathered from 253 participants born between 1980 and 2002 and had experience using mobile payments in Vietnam. The data met the minimum sample size requirement and were analyzed using partial least squares structural equation modeling (PLS-SEM). The findings indicated that customer trust and behavioral intention to use metaverse payment were significantly influenced by perceived usefulness, perceived enjoyment, security, and privacy concerns. However, perceived ease of use did not significantly impact the sense of trust. The study elucidates the significance and influence of derivative attributes in promoting trust by utilizing the metaverse payment system while emphasizing the role of trust in embracing this novel payment system.

Keywords: Metaverse Payment, Perceived Derived Attributes, Security and Privacy Concerns, Institution-Based Trust, Characteristic-Based Trust, Process-Based Trust

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1. INTRODUCTION

The metaverse is currently in the conceptual phase, but its potential is vast. According to Ritterbusch and Teichmann (2023), a metaverse is defined as "a (decentralized) three-dimensional online environment that is persistent and immersive, in which users represented by avatars can participate socially and economically with each other in a creative and collaborative manner in virtual spaces decoupled from the real physical world" (p. 12373). In the metaverse world, users can interact with each other, which creates a unique experience, and provide value (Boo & Suh, 2024). Metaverse allows users to earn profits and make purchases (Boo & Suh, 2024; Mourtzis et al., 2022). Thus, producers use the metaverse to save costs (IEEE Metaverse, n.d.), and the metaverse is controlled by providers,

so they have the power to govern the rules and the potential to extract the profits from the meta-economy (Ramírez-Herrero et al., 2024). The term "*metaverse*" is utilized in various research domains, including education, libraries (Guo et al., 2024), and commercial applications. Furthermore, cyberspace necessitates a resilient financial framework that compels payment systems to adjust to the era of digitalization. The payment infrastructure transitioned from traditional forms of payment, such as cash, credit-debit cards, and mobile banking, to the use of cryptocurrency wallets. Metaverse payment relies on virtual currencies, such as cryptocurrency and non-fungible tokens (NFTs), as the primary means of payment within the virtual world. In September 2022, the tech giant Meta changed the name of Facebook Pay to Meta Pay in order to strengthen their dedication to developing the future evolution of the metaverse (Jafar et al., 2023).

The metaverse payment system has significant development potential. However, it is essential to note that there is currently limited study on this payment system, and the concept still needs to be fully developed. In the metaverse payment infrastructure, the crypto wallet is one type of digital wallet that stores cryptocurrencies in the metaverse (J. P. Morgan, 2022). Previous studies have pointed to an overview of some types of this wallet (Barbereau & Bodó, 2023; Taylor et al., 2022). The meta-payment system transactions drive token transfers between accounts and user-smart contract interactions (Huang et al., 2022). Payment is an essential requirement in the current economy. However, in the virtual world or metaverse, there are alternative methods to carry out payment transactions (Melnychenko, 2021). Some metaverse platforms, such as Decentraland, SecondLife, and Axie Infinity, use NFTs or cryptocurrencies as official currencies to buy and sell goods and services (Bishop, 2022). The virtual currencies in the metaverse are different from conventional currency; the role of this type is that of the common currency in Meta, not subject to the influence of exchange rates or inflation. Some studies point to the correlation between NFTs and cryptocurrencies affecting the metaverse (Bejaoui et al., 2023; Dowling, 2022).

Prior research mainly emphasized the technological aspects and characteristics of meta-currency (Bejaoui et al., 2023; Dowling, 2022) without placing significant emphasis on customer variables. Metaverse payments are transforming consumer behavior by fostering greater familiarity with digital currencies, shifting spending patterns toward virtual goods, and creating new forms of engagement and commerce. Consumers' perceptions of value, security, and community in the digital world continue to evolve as they navigate this new landscape. Therefore, the role trust is vital role because it is essential for individuals to feel confident that their payment is secure and have control over how it is used. Many previous studies have shown that the role of trust is the key determinant of adoption technology (Hosseini Shoabjareh et al., 2024; McKnight & Chervany, 2001b), especially in the metaverse (Dang et al., 2024). However, the influence of trust on customer intentions to use metaverse is not explicitly addressed. Three key issues need to be considered to address the existing research gaps. Firstly, more research is needed on the concept of metaverse, particularly concerning metaverse payment. Secondly, measuring customer trust in using metaverse payment is essential, considering factors such as institution-based, characteristic-based, process-based, and antecedents of trust. Lastly, in the context of Vietnam's economy, meta-payment is a relatively new term that has not been widely adopted. As Vietnam is a developing country embracing the metaverse, it is crucial to adopt new payment methods to keep up with global economic development. Thus, the research question driving the study is:

RQ: Which cognitive derivatives influence customer trust that leads to the intention to use metaverse payment?

The study's primary objective is to enhance comprehension of consumer behavior in adopting a new payment system and the significant impact of derivative elements on trust. This includes identifying key cognitive factors that build and sustain customer trust, examining how trust influences the intention to use metaverse payment systems, and providing actionable insights for businesses and policymakers to foster a trustworthy environment for metaverse transactions.

The study is organized as follows. Section 2 provides theoretical background and hypotheses development. Section 3 details the research methodology. Section 4 presents the analysis results. Section 5 covers the discussion and Section 6 outlines the conclusion, limitation, and future study.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. Literature review

2.1.1. Metaverse payment

Metaverse is a complex concept that was first mentioned in the science fiction novel by Stephenson (1992). Payment service vendors will develop new capabilities to provide seamless user interfaces between metaverse platforms and consumers. For example, Apple Pay and Google Pay will incorporate cryptocurrencies and NFTs into their wallets to increase the number of payment methods they accept (Zalan & Barbesino, 2023). In another example, the Swiss Watchmaker Tag Heuer enabled their smartwatch to use NFTs and then bring items from the metaverse to the real world. This could connect to NFTs' wallets, show bought pictures, and verify their authenticity (Weking et al., 2023). Due to the novelty of the payment platform through the virtual world, the reach of customers is limited. Most customers know metaverse with virtual currencies such as Bitcoin and Binance Coin. However, the peculiarity of metaverse payment is that virtual payments have yet to build a special trust for customers, leading to less intending to use metaverse payment widely. Previous studies built and used a structured model of the metaverse to explore the nature of payments and conclude by identifying digital wallets as the central organizing principle (Birch & Richardson, 2023) or mentioned money, assets and ownership, there are significant changes that occur in metaverse through the impact

of cryptocurrencies, algorithmic collectibles, and NFTs (Belk et al., 2022), mentioned the monetary infrastructure (Zalan & Barbesino, 2023). Besides that, many studies discuss metaverse and the factors affecting the adoption of metaverse in healthcare (He et al., 2024), education (Akyürek et al., 2024), and its application in marketing (Alsoud et al., 2024). However, prior studies did not analyze the factors affecting customer intention to use metaverse payment. Therefore, this study estimates derived attribute factors that affect customers' belief in the metaverse payment development context. Researchers used the perceived derived attributes (PDA) model and the theory of trust to investigate the importance of payment systems in the metaverse and the factors that resulted in intentional behavior using metaverse payment.

2.1.2. Concept of perceived derived attributes

The concept of PDA was first established based on the technology acceptance model (TAM) (Elwalda et al., 2016). It aimed to investigate the impact of customer reviews on intention to use, including perceived usefulness, ease of use, and perceived enjoyment. TAM was created to examine how people adopt and utilize technology. It is based on the idea of reason action and describes how people adopt and use a technology, which is supported by the concepts of "perceived usefulness" and "perceived ease of use" (Davis, 1989; Elwalda et al., 2016). According to Davis et al. (1992), perceived enjoyment strongly influences behavioral intention. In addition, previous studies used security and privacy concerns as derived attributes that impact customers' beliefs (Alagarsamy & Mehrolia, 2023; Dhami et al., 2013). This study uses PDAs such as perceived usefulness, ease of use, perceived enjoyment, security, and privacy concerns to assess the role of derived attribute factors that affect customers' trust and lead to customers' intention to use metaverse payment.

2.1.3. Trust

Trust is the willingness of an individual to take risks to fulfill a need without prior experience or credible, meaningful information (Afshan & Sharif, 2016). According to Rempel et al. (1985), people have abstract positive expectations that they can count on partners to care for them and be responsible for their needs, now and in the future. The theory of trust states that someone with faith or confidence in another person, group, organization, or technology is socially and psychologically stable (Alrawad et al., 2023; Rempel et al., 1985). Trust is established on the premise that the other individual will consistently act in a manner that is beneficial, reliable, and foreseeable (Alrawad et al., 2023). Perceived ease of use and usefulness have been studied to positively impact trust (Teo et al., 2015). Within the research framework, customers' awareness of the user-friendly and effective nature of the metaverse payment system would enhance their trust in its usage, indicating their inclination towards adopting novel technologies like metaverse payment. Hence, using electronic means for currency transactions necessitates a specific degree of confidence, consequently influencing the customer's inclination to utilize the metaverse payment (Al-Kfairy et al., 2023). This study utilized prior research conducted by McKnight and Chervany (2001a), Hummels and Roosendaal (2001), McKnight et al. (2002), and See-To and Ho (2014) to investigate three aspects of trust: institution-based trust, characteristic-based trust, and process-based trust. This study asserts that customer acceptance plays a pivotal role in creating a secure environment for adopting and utilizing metaverse payment. This acceptance is predicated on three pivotal factors: 1) the presence of institutional conditions that cultivate confidence in the system (institution-based trust), 2) the conviction that the payment vendor in the metaverse possesses favorable attributes (characteristic-based trust), and 3) the belief that individuals are inclined to rely on others in various circumstances (process-based trust). This study examines the influence of cognitive derivatives on trust attributes, subsequently affecting customers' intention to use metaverse payment across different dimensions.

Review of the literature, the studies identify the three research gaps. First, previous studies focused on the technological aspects of metaverse payments and their implications (Birch & Richardson, 2023; Belk et al., 2022; Zalan & Barbesino, 2023), as well as their adoption in healthcare, education, and marketing (He et al., 2024; Akyürek et al., 2024; Alsoud et al., 2024). However, they did not analyze factors affecting customer intention to use metaverse payments. Second, previous studies also identified security and privacy concerns as factors impacting customer beliefs (Alagarsamy & Mehrolia, 2023; Dhami et al., 2013) providing a limited perspective on privacy and security concerns. This study uses perceived usefulness, ease of use, enjoyment, security, and privacy concerns to assess their role in affecting customer trust and intention to use metaverse payments. Third, previous studies examine trust as the single aspect in the financial transaction which does not provide an incomplete understanding of what influences user adoption and behavior (Alrawad et al., 2023; McKnight & Chervany, 2001b). This study, drawing on research by McKnight and Chervany (2001a), Hummels and Roosendaal (2001), McKnight et al. (2002), and See-To and Ho (2014), investigates three aspects of trust: 1) institution-based, 2) characteristic-based, and 3) process-based. It asserts that customer acceptance, based on these trust factors, is crucial for a secure metaverse payment environment.

2.2. Hypothesis development

2.2.1. Perceived derived attributes

Perceived usefulness is defined as the degree to which a person believes that using a particular system would enhance his or her performance (Davis, 1989). Perceived ease of use is defined as the degree to which an individual believes that using a particular system enhances productivity (Davis, 1989). That mentioned a person's subjective evaluation of the value a new information technology system provides in a particular task-related setting is measured by its perceived usefulness. Increased perceived ease of use relates to increased trust (Alagarsamy & Mehrolia, 2023). Any service that saves

the customer time and offers flexible, customizable services fosters a favorable view of the service provider (Alagarsamy & Mehrolia, 2023). Many experts have argued that the most crucial elements of trust are perceived usefulness and ease of use (Amin et al., 2014; Hajiheydari & Ashkani, 2018; Kasilingam, 2020), which also affects trust dimensions. Some previous studies on mobile payment have also shown the impact of perceived usefulness and perceived ease of use on customer trust (Primanda et al., 2020; Sarkar et al., 2020). In the metaverse payment context, perceived usefulness and ease of use are potential antecedents of the trust dimension in perceived intention to use metaverse payment. Thus, the following hypothesis is advanced:

H1a: Perceived usefulness positively affects institution-based trust.

H1b: Perceived usefulness has a positive effect on characteristic-based trust.

H1c: Perceived usefulness positively affects process-based trust.

H2a: Ease of use positively affects institution-based trust.

H2b: Ease of use positively affects characteristic-based trust.

H2c: Ease of use positively affects process-based trust.

Perceived enjoyment is defined as the degree to which the activity of using technology is perceived to be enjoyable, apart from any performance consequences that may be anticipated (Davis et al., 1992). Intrinsic motivation (i.e., enjoyment, fun, entertainment, and playfulness) is critical for building customer trust and the intention to utilize new systems and applications. (Alagarsamy & Mehrolia, 2023; Davis et al., 1992). Numerous research cases investigating perceived enjoyment have found a significant effect of trust (Kasilingam, 2020; Rouibah et al., 2016). Perceived enjoyment is the foundation for beliefs such as institutions, characteristics, and processes that are consolidated in using metaverse payment. Perceived enjoyment in using an innovative technology builds belief for customers to use, thus:

H3a: Perceived enjoyment positively affects institution-based trust.

H3b: Perceived enjoyment positively affects characteristic-based trust.

H3c: Perceived enjoyment positively affects process-based trust.

Security and privacy concerns: metaverse wallets contain various digital assets (e.g., NFTs, tokens, cryptocurrencies) on proprietary platforms, the continuity of engaging user experiences and the tension between transparency, privacy, and personal security becoming top security and privacy concerns (Zalan & Barbesino, 2023). Security and privacy concerns are divided into threats and vulnerabilities (Deng et al., 2011). A security threat is the possibility of compromised systems and data (Alagarsamy & Mehrolia, 2023). Unethical hackers may use vulnerabilities in computer systems to cross privileged borders (Alagarsamy & Mehrolia, 2023), such as insecure coding, out-of-date hardware drivers, a weak firewall, and human error. Many threats can be mentioned, such as account fraud, disclosure of information, services not provided, elevation of privilege, and tampering (Deng et al., 2011). Metaverse payment embedded innovative technologies that customers need to learn about security, which leads to a lack of customer trust, so they are hesitant to share their information with its payment services. Thus, we hypothesize that:

H4a: Security and privacy concerns have a negative effect on institution-based trust.

H4b: Security and privacy concerns have a negative effect on characteristic-based trust.

H4c: Security and privacy concerns have a negative effect on process-based trust.

2.2.2. Trust

Institution-based trust

Institution-based trust is the belief that needed structural conditions are present (e.g., the regulations and legislations) to enhance the probability of achieving a successful outcome and that the environment is safe enough to interact with this technology (Alrawad et al., 2023; McKnight et al., 2002a). Previous studies divide the institution-based trust into two dimensions: 1) structural assurance and 2) situational normality (Al-Kfairy et al., 2023; McKnight et al., 2002; See-To & Ho, 2014). Structural assurance indicates that mechanisms, such as guarantees, regulations, promises, legal remedies, or other procedures, are thought to exist to promote success (See-To & Ho, 2014). In metaverse payment, when customers believe that the institutional structure is the legal basis, the technology in metaverse payments ensures protection for customers when they make decisions using metaverse payment. Situational normality is a person's trust in the situations they face when interacting with the institution, which will be normal. (See-To & Ho, 2014). With metaverse payment, the situation usually means that the payment system builds the customer's confidence and makes them feel comfortable using the payment service, thus leading to the intention to use it. Accordingly, in this research paper context, metaverse payment must ensure two aspects of the institution-based trust to lead to the customer's intended usage behavior. If a payment system ensures institutional aspects, customers will have trust when using the system. Thus, the following hypothesis is stated:

H5: Institution-based trust positively affects customers' intention to use it.

Characteristic-based trust

Characteristic-based trust is defined as one's belief that the other party has one or more characteristics that are beneficial to oneself (McKnight & Chervany, 2001b). In other words, it refers to the confident, trusted perception that the trustee has attributes that benefit the truster (McKnight et al., 2002). Characteristic-based trust has three main characteristics: 1) benevolence, 2) competence, and 3) integrity (Hummels & Roosendaal, 2001; McKnight et al., 2002; McKnight & Chervany, 2001b). According to Alrawad et al. (2023), benevolence refers to customers' perception that the organization they want to interact with cares about their well-being and will take all reasonable steps to safeguard and secure their money. A payment service provider builds trust through benevolence, which cannot exploit customer kindness. Build their belief that

payment services can protect them and do everything to help them maintain their trust. Competence is when one believes that the other party has the ability or power to do for one what one needs to (McKnight & Chervany, 2001b). In the metaverse payment context, this characteristic reflects the ability of the payment provider in the metaverse to provide the necessary security devices to ensure secure transactions, including the security of money transactions on the metaverse, protecting privacy security with the necessary policies. Characteristic integrity is defined as the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable (Mayer et al., 1995). On the other hand, the payment service provider must capture the customer's trust with the payment services provided that are trustworthy, accurate information, and always fulfilling their commitments (Alrawad et al., 2023; McKnight & Chervany, 2001b). Accordingly, if the customer has high confidence in the above characteristics, they will trust and use metaverse payment. This argument leads to the following hypothesis:

H6: Characteristic-based trust positively impacts customers' intention to use metaverse payment.

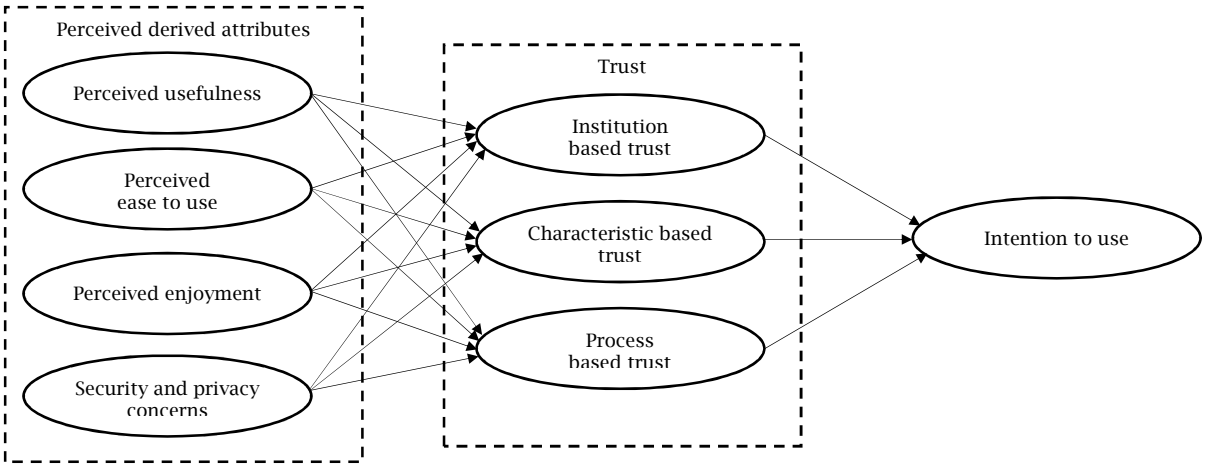
Process-based trust

Process-based trust means a general propensity to trust others, which can also influence an individual's beliefs and intentions towards a Web-based vendor (McKnight et al., 2002a). According to Al-Kfairy et al. (2023) and McKnight et al. (2002), process-based trust is the extent to which a person is willing to rely on others in various situations. Process-based trust stresses the need to be receptive to the trustor's demands based on prior successful collaboration and a desire to maintain the connection (Hummels & Roosendaal, 2001). In the context of metaverse payments, if past performance and customer-vendor relationships are not tight, it will unlikely lead to future cooperation. Consumers will trust metaverse payment providers if they have interacted with them previously and, based on those interactions, have not suffered any loss, such as intellectual, belief, or privacy loss, which led to the intention to use metaverse payment. Thus, we hypothesize that:

H7: Process-based trust positively influences customer's intention to use metaverse payment

From all the hypotheses above, Figure 1 shows the conceptual framework as follows.

Figure 1. Conceptual model



3. RESEARCH METHODOLOGY

3.1. Statistical methods

Many published scientific works have demonstrated the popularity of structural equation modeling (SEM) as an analytical method (Dang et al., 2024; Dang et al., 2023). There are two methods for conducting SEM: 1) covariance-based SEM (CB-SEM) and 2) partial least squares SEM (PLS-SEM). Rather than being competitive, both methodologies are complementary.

The PLS-SEM is applied in this study because it is primarily used to determine/predict structure or to probe an extension of an existing structural theory, which is relevant to the main goal of this study, which is to identify what factors influence customers' trust and intention to use metaverse payment, making the PLS-SEM appropriate. Furthermore, multiple studies demonstrate the use of PLS-SEM in a wide range of technological applications in various contexts, particularly the metaverse (Dang et al., 2024; Dang et al., 2023).

Lastly, to improve theory development, we proposed implementing a multi-analytical hybrid PLS-SEM-ANN (artificial neural network) technique for information technology research, which can solve the inadequacies that exist in the single method (Leong et al., 2024).

3.2. Sampling method, sample size, and questionnaire design

Due to geographical constraints, the study focused on Ho Chi Minh City, Vietnam's central city, where online and digital payment methods were common (Statista, n.d.). The sampling was a non-probability with judgmental sampling method that selected respondents based on criteria like online and digital payment experience and birth year between 1980 and 2002. Using G*Power version 3.1 software (Faul et al., 2007), researchers determined a minimum sample size of 103 with an effect size of $f^2 = 0.15$, probability of error $\alpha = 0.05$, power levels $(1 - \beta) = 0.8$, and eight predictors. The 253 responses exceeded the minimum sample size requirement.

To ensure data reliability, questionnaire items were adapted from previous studies. The study uses a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree) to evaluate all items. Perceived usefulness, security, and privacy concerns were adapted from (Davis, 1989; Liébana-Cabanillas et al., 2018). Ease of use and perceived enjoyment were adapted from Liébana-Cabanillas et al. (2018). Adapting institution-based trust (*IT*) was from McKnight et al. (2002), characteristic-based trust (*CT*) from McKnight et al. (2002), process-based trust (*PT*) from Al-Kfairy et al. (2023), and intention to use (*IU*) from Liébana-Cabanillas et al. (2018).

4. DATA ANALYSIS AND RESULTS

4.1. Demographic profiles and descriptive statistics

According to Table 1, the gender of respondents was female, accounting for 65.61%, while males just accounted for 34.39%. People born in 1981–1995 have 21.34%, primarily respondents aged 1996–2012 (78.66%). Most survey participants were students (62.85%), and the fewest responses were from professionals such as doctors and teachers (5.14%). The type of payment mentioned by respondents was mainly mobile (Momo, Zalopay); only 1.19% preferred using Bitcoin and cryptocurrencies for payments. In total, those with a basic understanding of NFTs and cryptocurrencies accounted for 62.84%, experts in this field were 2.77%, those who did not understand were 18.58%, and 15.81% had a good knowledge of NFTs and cryptocurrencies. Respondents who never used NFTs or cryptocurrencies accounted for 35.97%, followed by those who used it 1–2 times — 24.51%, and those who used it daily accounted for 13.83%.

Moreover, in Table 2, the average of all variables is greater than 4, indicating a high level of user interest in using metaverse for payments.

Table 1. Respondent profiles

Demographic characteristics		*Frequency*	*Percentage (%)*
Gender	Male	87	34.39
	Female	166	65.61
	Total	**253**	**100**
Born year	1981–1995	54	21.34
	1996–2012	199	78.66
	Total	**253**	**100**
Job	Students	159	62.85
	Self-employed	33	13.04
	Paid employee	48	18.97
	Professional (doctor, teacher.)	13	5.14
	Total	**253**	**100**
Type of payment	Cash	50	19.76
	Mobile banking	155	61.26
	Credit/debit card	45	17.79
	Bitcoin and cryptocurrencies	3	1.19
	Total	**253**	**100**
Understanding of NFTs or cryptocurrency	Have no understanding	47	18.58
	Have basic understanding	159	62.84
	Have a good understanding	40	15.81
	An expert	7	2.77
	Total	**253**	**100**
Usage frequency of NFTs or cryptocurrency	Never	91	35.97
	Used once or twice, but no longer	62	24.51
	Sometimes	17	6.72
	Once or twice a month	13	5.14
	More than three times a month	18	7.11
	More than three times a week	17	6.72
	Everyday	35	13.83
	Total	**253**	**100**

Table 2. The descriptive aspect of the variables

Variables	*N*	*Mean*	*Std. deviation*
Perceived usefulness (PU)	253	5.96	1.18
Ease of use (PEOU)	253	6.18	1.11
Perceived enjoyment (PE)	253	5.56	1.32
Security and privacy concerns (SCP)	253	5.90	1.07
Institution-based trust (IT)	253	5.77	1.22
Characteristic-based trust (CT)	253	5.72	1.26
Process-based trust (PT)	253	5.65	1.20
Intention to use (IU)	253	5.95	1.06

4.2. Common method bias

Prior research has suggested a methodological and statistical approach for reducing the common method bias (CMB) that could result from a singular-source-data collection process (Hair et al., 2017). Procedure-wise, efforts were made to guarantee the anonymity of participants. Furthermore, responses were evaluated neutrally and were not categorized as true or false. This approach aims to promote candid and transparent responses to all inquiries. The single-factor analysis performed by Harman was approached from a statistical perspective (Nguyen et al., 2024). Utilizing Harman's singular factor, CMB was assessed. A factorization of the structures was performed. The explanation for the most significant

variable through a single component was 42.75%, which fell short of the minimum requirement of 50%. CMB data is, therefore, unconcerned.

4.3. Assessing the outer measurement model

Researchers use Smart PLS4 software because the research has a large sample size and variables for analysis data to measurement and structural model. This software is the most appropriate way for the main purpose of analyzing the development of theory (Albayati et al., 2023). For the measurement model, the research assesses some elements: 1) convergent reliability and 2) discriminant validity. Firstly, to test convergent validity, the average variance extracted (AVE) is required to be more than 0.5 and with the basic rule of thumb, factors loadings (FL) is higher than 0.7 (Hair et al., 2017). In Table 3, AVE, ranging from 0.677 to 0.872, are all larger than the lower limit, and items loading all exceed the 0.7 threshold. Thus, the convergent validity of the model is accepted. To test the reliability of a construct, both composite reliability (CR) and Cronbach's alpha coefficients must be greater than 0.7. In Table 3, those indicators exceeded the threshold of 0.7 and were greater than AVE, showing that the construct has good internal stability confidence, and the reliability of the construct is confirmed. Next, cross-loading and the Fornell-Larcker criterion (Fornell & Larcker, 1981) are used to assess discriminant validity. In Table 5, the square root of AVE is higher than other constructs' correlation coefficient. In addition, according to the cross-loading test in Table 4, the indicators show that the item loading is much stronger than its related construct, and cross conditions are met. The result presents that the discriminant validity is satisfied.

Table 3. Loading, composite reliability, Dijkstra-Henseler, and average variance extracted

Variables	*Items*	*FL*	*Cronbach's alpha*	*Composite reliability (rho_a)*	*Composite reliability (rho_c)*	*AVE*	*VIF*
PU	*PU1*	0.808	0.761	0.766	0.862	0.677	1.421
	PU2	0.860					1.766
	PU3	0.799					1.587
PEOU	*PEOU1*	0.887	0.854	0.857	0.911	0.773	2.185
	PEOU2	0.884					2.325
	PEOU3	0.867					1.924
PE	*PE1*	0.866	0.821	0.824	0.893	0.736	1.984
	PE2	0.821					1.625
	PE3	0.887					2.095
SPC	*SPC1*	0.901	0.884	0.884	0.928	0.811	2.536
	SPC2	0.909					2.715
	SPC3	0.892					2.319
PT	*PT1*	0.944	0.926	0.928	0.953	0.872	4.264
	PT2	0.943					4.242
	PT3	0.913					2.954
CT	*CT1*	0.869	0.805	0.825	0.885	0.721	1.998
	CT2	0.901					2.169
	CT3	0.771					1.487
IT	*IT1*	0.851	0.831	0.831	0.899	0.748	1.792
	IT2	0.888					2.227
	IT3	0.855					1.892
IU	*IU1*	0.927	0.899	0.903	0.937	0.832	3.192
	IU2	0.897					2.643
	IU3	0.912					2.689

Note: VIF — variance inflation factor.

Table 4. Cross-loading factor

	CT	*IT*	*IU*	*PE*	*PEOU*	*PT*	*PU*	*SPC*
CT1	**0.869**	0.679	0.642	0.566	0.472	0.685	0.596	0.529
CT2	**0.901**	0.659	0.714	0.634	0.541	0.694	0.600	0.632
CT3	**0.771**	0.453	0.515	0.479	0.319	0.543	0.525	0.444
IT1	0.625	**0.851**	0.619	0.604	0.526	0.574	0.607	0.567
IT2	0.629	**0.889**	0.557	0.552	0.412	0.571	0.666	0.591
IT3	0.594	**0.855**	0.565	0.582	0.469	0.611	0.642	0.582
IU1	0.680	0.632	**0.927**	0.614	0.624	0.671	0.617	0.682
IU2	0.659	0.527	**0.897**	0.545	0.589	0.587	0.500	0.664
IU3	0.690	0.670	**0.912**	0.626	0.608	0.705	0.606	0.709
PE1	0.550	0.545	0.501	**0.861**	0.431	0.583	0.455	0.459
PE2	0.513	0.608	0.579	**0.826**	0.459	0.497	0.491	0.565
PE3	0.642	0.573	0.600	**0.886**	0.493	0.589	0.548	0.531
PE0U1	0.488	0.497	0.631	0.498	**0.887**	0.474	0.525	0.552
PE0U2	0.458	0.43	0.576	0.448	**0.886**	0.384	0.462	0.509
PE0U3	0.459	0.501	0.548	0.471	**0.865**	0.471	0.488	0.506
PT1	0.728	0.657	0.683	0.614	0.494	**0.945**	0.601	0.619
PT2	0.703	0.624	0.688	0.601	0.481	**0.945**	0.552	0.618
PT3	0.698	0.615	0.644	0.604	0.440	**0.911**	0.548	0.533
PU1	0.586	0.628	0.550	0.512	0.506	0.548	**0.805**	0.532
PU2	0.571	0.652	0.562	0.490	0.483	0.495	**0.863**	0.602
PU3	0.506	0.531	0.436	0.430	0.383	0.45	**0.799**	0.454
SPC1	0.617	0.570	0.698	0.545	0.598	0.556	0.539	**0.901**
SPC2	0.539	0.629	0.664	0.540	0.483	0.561	0.584	**0.909**
SPC3	0.566	0.615	0.671	0.550	0.526	0.594	0.627	**0.892**

Table 5. Fornell-Lacker criterion

	CT	IT	IU	PE	PEOU	PT	PU	SPC
CT	0.849							
IT	0.712	0.865						
IU	0.742	0.672	0.912					
PE	0.665	0.669	0.653	0.858				
PEOU	0.533	0.544	0.666	0.538	0.879			
PT	0.760	0.677	0.720	0.650	0.507	0.934		
PU	0.677	0.738	0.632	0.582	0.561	0.608	0.822	
SPC	0.637	0.671	0.752	0.604	0.595	0.633	0.648	0.901

4.4. Assessing the inner structural model

To measure the structural model, the study measures R^2 and uses the bootstrapping procedure. R^2 should be larger than or equal to 0.1 to explain the differences in endogenous structure.

Table 6. R-square

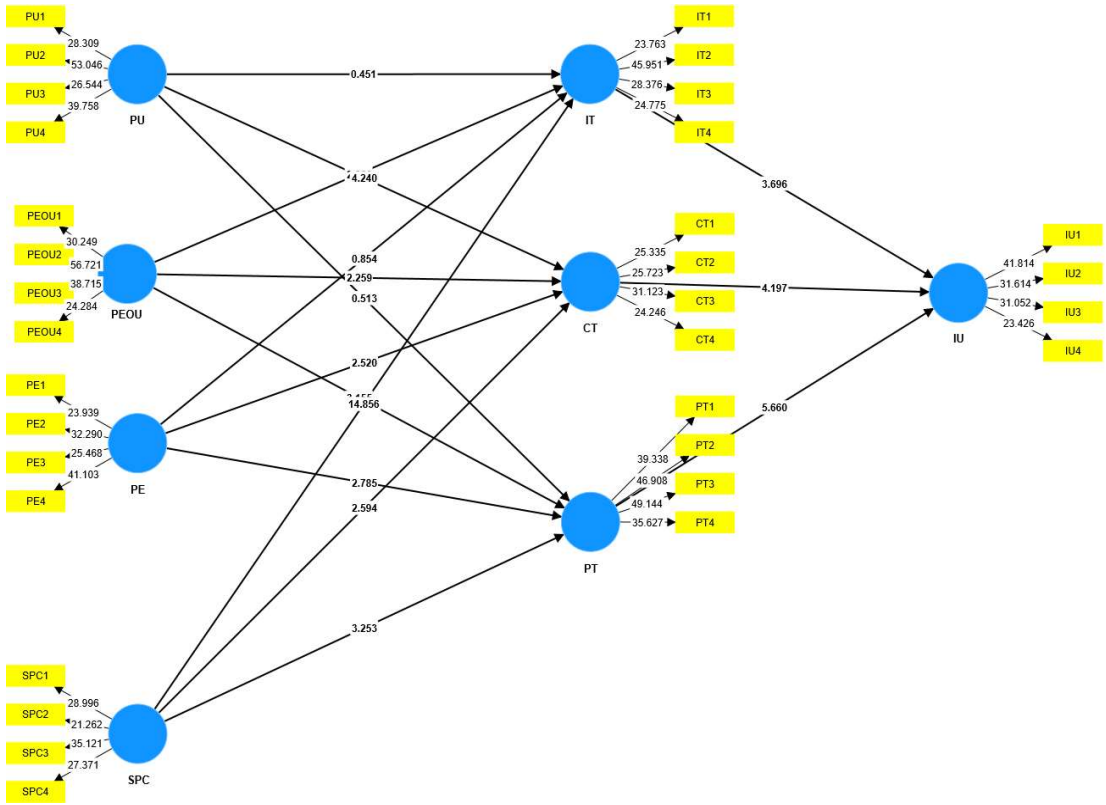
Variables	R-square	R-square adjusted
CT	0.593	0.587
IT	0.657	0.651
IU	0.627	0.623
PT	0.541	0.534

In Table 6, R^2 exceeds 0.1 which is a moderate value to explain why certain dependent variables are considered sufficient. To perform the inner structure, the study uses a bootstrapping process with 5000 subsamples with no sign change and 95% confidence intervals (Hair et al., 2017).

Table 7. Outcome of the structural model examination

Hypotheses	Pathways	Original sample (O)	Standard deviation (STDEV)	t-values	p-values	Remarks
H1a	*PU → IT*	0.421	0.075	5.612	0.000	Supported
H1b	*PU → CT*	0.330	0.082	4.025	0.000	Supported
H1c	*PU → PT*	0.213	0.071	3.021	0.003	Supported
H2a	*PEOU → IT*	0.032	0.053	0.595	0.552	Unsupported
H2b	*PEOU → CT*	0.059	0.078	0.751	0.453	Unsupported
H2c	*PEOU → PT*	0.048	0.062	0.778	0.437	Unsupported
H3a	*PE → IT*	0.280	0.054	5.207	0.000	Supported
H3b	*PE → CT*	0.325	0.078	4.142	0.000	Supported
H3c	*PE → PT*	0.344	0.082	4.208	0.000	Supported
H4a	*SPC → IT*	-0.211	0.064	-3.294	0.001	Supported
H4b	*SPC → CT*	-0.192	0.089	-2.166	0.030	Supported
H4c	*SPC → PT*	-0.259	0.078	-3.330	0.001	Supported
H5	*IT → IU*	0.208	0.073	2.846	0.004	Supported
H6	*CT → IU*	0.364	0.071	5.138	0.000	Supported
H7	*PT → IU*	0.303	0.071	4.280	0.000	Supported

Figure 2. Structural model testing



In Figure 2 and Table 7, hypothesis testing results are presented. It is considered to be at a significant level when the t-values are more than 1.96 and the p-values are less than 0.5. According to Table 7 and Figure 2, 12/15 hypotheses are supported. The results show that *PU* has a significant effect on *IT*, *CT*, and *PT*, so *H1a*, *H1b*, and *H1c* are accepted (p-value < 0.05). *H2a*, *H2b*, and *H2c* presenting the relationship between *PEOU* and trust dimensions such as *IT*, *PT*, and *CT* are not supported (p-value > 0.05). The results show that *PE* and *SPC* have a considerable effect on *IT, PT*, and *CT*, so *H3a*, *H3b*, *H3c*, *H4a*, *H4b*, and *H4c* are supported (p-value < 0.05). Trust dimension *IT*, *PT*, and *CT* positively influence *IU*, supporting *H5*, *H6*, and *H7*.

5. DISCUSSION

Although metaverse payment is still in its infancy, its route to becoming a mainstay of payment methods, like mobile payment and online money payment, is inevitable. Meanwhile, payment service providers are increasing the development of payment methods to meet customers' needs. The new methods must be consistent with the development of technology and meet the belief that using this new payment method will bring value to the customer. The study examines the conceptual framework of PDA (Elwalda et al., 2016) and trust theory (Afshan & Sharif, 2016; Alrawad et al., 2023; Dhami et al., 2013) to identify the aspects that impact adaptive belief in metaverse payment. This paper is the inaugural investigation into the impact of the PDA and trusts factors on behavioral intention to use metaverse payment in Vietnam, as per the researchers' perspective.

The research findings validate that there is a compelling motivation to utilize metaverse payment in the majority of research domains. The favorable impacts of perceived usefulness on trust within institutions, trust based on characteristics, and trust based on processes are consistent with prior studies conducted in various settings (Amin et al., 2014; Hajiheydari & Ashkani, 2018; Kasilingam, 2020). This study proposes that the perceived usefulness of payment systems is crucial for establishing trust within the metaverse, instilling customers with a sense of assurance when conducting transactions in this virtual environment. Despite being in its nascent phase, metaverse payment has enhanced customer convenience by providing swift transactions and the ability to convert currency or tokens.

Additionally, the observed beneficial and significant effects of face-to-face learning on trust in institutions, trust in characteristics, and trust in processes are consistent with previous research by Kasilingam (2020) and Rouibah et al. (2016). However, the findings of this study also suggest that security and privacy concerns negatively impact trust in institutions, trust based on characteristics, and trust based on processes. The identified strong correlation validates previous research findings that indicate a decrease in trust in new payment environments due to risk factors, specifically concerns related to security and privacy (Deng et al., 2011).

Institution-based trust, characteristic-based trust, and process-based trust all impact the behavioral intention to use metaverse payment. This discovery contradicts findings documented in other research studies (Alrawad et al., 2023; McKnight & Chervany, 2001b; Al-Kfairy et al., 2023; McKnight et al., 2002). The correlation between trust and intention to use metaverse payment is essential for building user confidence, reducing perceived risks, encouraging repeated usage, and fostering the overall success of these innovative payment platforms in virtual environments. Trust is a vital factor in the dynamic realm of emerging technologies, affecting user behavior and influencing the speed of technology adoption (Nguyen et al., 2023).

According to the study results, perceived usefulness and perceived enjoyment are factors that impact aspects of customer trust. Moreover, security and privacy concerns greatly affect customer trust, which in turn influences their intention to use metaverse payments. Customer behavior significantly impacts the capitalist economy, shaping factors that influence the intention to use metaverse payments. This creates a portrait of growth, increasingly meeting customer needs and driving the economy to develop innovative, useful, and safe virtual products.

To summarize, a new payment system should prioritize shifting from conventional payments to virtual payments by guaranteeing the security and confidentiality of all data and transactions. Additionally, it should focus on improving user experience to avoid boredom and boost trust in using metaverse payments. Prior studies have established a correlation between derivative perception and belief, as evidenced by research conducted by Alagarsamy and Mehrolia (2023), Amin et al. (2014), Hajiheydari and Ashkani (2018), Kasilingam (2020), and Rouibah et al. (2016). This research bolsters and adds to the convictions regarding the influence on the inclination to utilize novel payment methods. The level of trust in the new payment system depends on the extent to which customers, specifically those born between 1980 and 2012, are knowledgeable about it. Prior research has established a correlation between PDA variables and trust, as evidenced by studies conducted by Amin et al. (2014), Dhami et al. (2013), and Elwalda et al. (2016). Additionally, research by Al-Kfairy et al. (2023), McKnight et al. (2002), and McKnight and Chervany (2001b) has demonstrated a significant association between factors such as institutional, process, and characteristics and the presence of information uncertainty. This study offered additional understanding in the field of metaverse transactions, emphasizing that the choice to implement a new payment system like Metaverse is influenced by multiple factors, with cognitive derivatives playing a significant role in shaping user trust.

6. CONCLUSION

This study significantly enhances the existing body of knowledge on payment in the metaverse by integrating the trust theory and the PDA model. It investigates the factors that influence users' intention to use the system. The findings endorse the adoption of a comprehensive assurance framework aimed at captivating customers' attention regarding virtual world transactions. This requires a commitment to security and privacy protocols that have been

meticulously optimized to reduce the risk of unauthorized disclosure of personal information. The adoption of a novel payment system, characterized by its convenience, encourages users to opt for metaverse payments instead of other virtual world payment methods.

Furthermore, the study highlights the importance of pleasure and its ability to stimulate user interest, thereby increasing the attractiveness of metaverse transactions. The research not only provides immediate practical implications but also lays the groundwork for future advancements by proposing strategies to assess PDA factors. This ensures the establishment of customer trust before the widespread adoption of digital payment methods. A pledge is undertaken to ensure and strengthen security protocols to safeguard absolute confidentiality in transactions on digital platforms, acknowledging that consumers inherently possess a restricted level of trust in the virtual realm. Simultaneously, the investigation builds upon prior scholarly investigations regarding PDA and trust, offering scholars valuable insights and discoveries in the realm of metaverse payment.

In summary, the research made a valuable contribution to the existing body of knowledge on metaverse payment, the PDA model, and trust theory as it relates to usage intention. The research indicates that establishing a strong sense of trust is crucial for attracting customer attention to virtual world payments. This can be achieved by prioritizing security and privacy measures to prevent unauthorized access to personal information. Additionally, the study highlights the unique features of the metaverse payment method that make it preferable over other virtual world payment options. The user's curiosity is stimulated by the values of enjoyment. The research also facilitates future innovations by employing strategies that evaluate PDA factors to establish customer confidence prior to implementing payment methods on a large scale. Ensuring robust security measures are in place is essential to maintain privacy in virtual transactions, as customers' trust in the system remains incomplete. Simultaneously, this study enhances the existing body of literature on PDA and trust by offering valuable insights and findings that can assist scholars in augmenting their understanding of metaverse payment.

It is important to acknowledge that the study has significant limitations due to the small sample size and the lack of cultural considerations in the investigation. Furthermore, the study's focus is limited to the intention to use without investigating the subsequent stages of actual utilization. Therefore, these limitations emphasize the necessity for future empirical investigations to further develop and enhance our comprehension of the dynamics related to the adoption of metaverse payments. This is especially important in addressing cultural subtleties and moving beyond the intention to use as the final focus of analysis.

Metaverse payment, being an emerging technology in the digital world, requires a thorough understanding of the factors that influence people's willingness to adopt this innovation. These insights are crucial for service providers and consumers as they consider incorporating metaverse payment into their operations. The research findings highlight the importance of perceived usefulness, enjoyment, security, and privacy concerns in influencing customers' belief in their intention to adopt metaverse payment. In contrast, the influence of user-friendliness on customer trust and concerns regarding security and privacy is not significant in a meaningful way.

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