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Understanding Users' Behavioral Intention to Use the Digital Currency Electronic Payment in China

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Abstract

In 2014, the Digital Currency Electronic Payment (or DC/EP) was introduced in China with the goal of improving monetary and financial supervision. Following its initial trial in 2019, the effectiveness and level of acceptance of DC/EP among the people of the Republic of China is yet unknown. On that account, the purpose of this paper is to investigate the factors that drive the behavioral intention to use the DC/EP in China. Using quantitative online survey method, a total of 392 valid responses were received from the people that had used the DC/EP. Data was analysed through structural equation modelling technique using the SMART-PLS 4.0 software. The results suggest that perceived usefulness, perceived ease of use, user's attitude and user's trust are significantly associated with user's behavioral intention to use the DC/EP, and that there is a high acceptance of digital currency in China. Additionally, the results also showed the importance of social influence which significantly influences user's intention to accept the new technology. The findings of this study serve as part of the theoretical foundation for future research into the deployment of digital currency electronic payment systems.

Keywords: Central Bank Digital Currency, Digital Currency Electronic Payment, Fin-Tech, China

Introduction

In recent years, there has been a rapid increase in global interest surrounding digital currency. Digital currency refers to a type of electronic money used for making payments across various online platforms. Unlike physical forms of payment like bills and coins, digital currency

operates within a computerized digital system where it is controlled and exchanged. Cryptocurrency, a specific type of digital currency, is created through a cryptographic process called blockchain, without the involvement of a central authority dictating its value (Swati, 2018; Bakar, et al., 2017). The unregulated, unchangeable, and decentralized nature of cryptocurrency has unfortunately paved the way for various financial crimes, including terrorist financing, underground market transactions, and illicit transfer of domestic assets (Teichmann and Falker, 2020).

Recognizing the importance of exerting better control over the application of digital currency, the Central Bank of a specific country introduces and issues a Central Bank Digital Currency (CBDC). In the case of China, research efforts aimed at developing a digital currency electronic payment (DC/EP), which is essentially a digital version of the Chinese currency (RMB), have been underway since 2014. The Central Bank of China established a dedicated research team to drive this development. On August 14, 2020, China initiated the "Comprehensive Deepening of Service Trade Innovation and Development Pilot Program" in Shenzhen, Chengdu, Suzhou, and Xiong'an new districts. The technical implementation of DC/EP has the potential to significantly mitigate financial risks by enabling relevant institutions to effectively monitor, track, and analyze unusual changes in non-performing assets. This robust monitoring system empowers the People's Bank of China to address common challenges present in China's financial system, such as shadow banking, biased lending, and informal financing (Yaya and Emily, 2021).

However, there have been various concerns surrounding the adoption of Digital Currency Electronic Payment (DC/EP) in China since its initial trial in 2019. It is worth noting that a significant number of people in China, approximately 852.5 million individuals, are already using mobile payment methods (Ma, 2021). As a result, users tend to compare the features of different mobile payment applications, including service quality, payment methods, and overall usefulness. While mobile payment has become increasingly prevalent in many scenarios, some users still find cash more convenient than mobile payments due to the requirement of an internet connection for DC/EP transactions. According to a survey on the understanding and adoption of DC/EP, conducted by Ye (2020), 51.52% of respondents perceive DC/EP as "digital cash with anonymity." However, this concept is not universally accepted by Chinese residents, as the digital yuan faces competition from other established payment methods in the market. It is important to note that the survey was conducted during the initial stage of DC/EP implementation and was limited to specific areas and a specific timeframe. In a recent study by Wu et al. (2022), several factors influencing people's intention to use DC/EP were identified. However, this study only considered a limited number of factors, explaining approximately 65% of the total variance.

Other that that, there is a gap concerning DC/EP is in terms of theoretical knowledge (Yaya and Emily, 2021). While the basic application of DC/EP is described, the actual feedback of DC/EP in the marketplace is not addressed in Shi and Sun's study (2020). There are also limitations concerning sample collection. Due to the recent Covid-19 outbreak, researchers are forced to cancel face-to-face interviews and surveys, affecting the accuracy of data collection (Shi and Zhou, 2020). Despite the advantages of DC/EP, there remains significant uncertainty regarding how individuals perceive and intend to adopt this digital payment method. In light of the aforementioned situation, the present study aims to examine the factors that influence user’s behavioral intention to use the DC/EP in China, providing a deeper understanding of its acceptance and usage patterns. This study is motivated by the fact that China has been at the forefront of developing a Central Bank Digital Currency with

DC/EP. As one of the first major economies to explore and implement such a system, understanding its progress and impact can provide valuable insights for other countries considering similar initiatives. Additionally, examining how individuals adopt and use the DC/EP can offer valuable insights into consumer behavior, preferences, and concerns regarding digital currencies, leading to better-designed financial services.

Literature Review

Intentions serve as indicators of individuals' level of commitment and the amount of effort they are willing to exert to carry out a behavior (Ajzen, 1991). Prior research has documented several predictors that can influence individuals' intentions to engage in a specific behavior. The Theory of Planned Behavior excerts that individuals' behavioral intentions are influenced by three main factors which are attitudes, subjective norms, and perceived behavioral control. Attitudes refer to an individual's overall evaluation or appraisal of a particular behavior. Attitudes are formed based on beliefs about the outcomes or consequences of performing the behavior and the subjective value attached to those outcomes. Subjective norms represent the perceived social pressure and expectations associated with the behavior. They encompass the individual's perception of what significant others, such as friends, family, or society, think they should do or what their social group expects them to do. Perceived behavior control on the other hand, refer to the individuals believe on their ability to perform such behaviors.

Meanwhile, the Technology Acceptance Model (TAM) has found extensive application across various disciplines, including information systems, education, and other fields, to gain deeper insights into the patterns of technology adoption (Ndubisi, 2006). In their study, Folkinshteyn and Lennon (2016) found that the TAM serves as a comprehensive framework for predicting individuals' intentions to adopt new technology. The TAM can be seen as an extension or a specialization of the TPB specifically designed to explain technology adoption and usage. It was initially proposed by Davis (1986) and later extended by Davis et. al. (1989). The TAM model focuses on individuals' acceptance and adoption of information technology and provides a theoretical framework to understand the factors that influence users' behavioral intentions and actual usage of technology. It considers perceived usefulness (analogous to attitudes) and perceived ease of use (related to perceived behavioral control) as the primary factors influencing individuals' intentions and actual usage of technology. In 1992, the TAM Model has been extended by incorporating two additional constructs that may influence users' acceptance of technology, namely subjective norms (social influence and pressure from others to adopt the technology) and cognitive instrumental processes (individual differences that affect how individuals process information and form beliefs). This expansion aimed to provide a more comprehensive understanding of the adoption process. Later, Venkatesh and Bala (2008) expanded the model and proposed TAM 3 as a tool to evaluate the acceptance and intention of using new intelligent technologies. Three theoretical extensions beyond TAM2 and the model of the determinants of perceived ease of use were introduced in TAM3, which involve several traits such as computer self-efficacy, computer playfulness and computer anxiety. TAM 3 emphasized that users' positive emotional experiences with a technology can enhance their intention to adopt and use it.

Meanwhile, trust concerns an individual's future expectations based on previous performance (feedback to past interactions). Trust is one of the reasons why users do not use online transactions is their distrust of online systems (Donna, et al., 1999). When users choose to use electronic payment, they need to establish trust in the system by sourcing accurate

information concerning user uncertainty (Jarvenpaa, et al., 2000; Koufaris, 2002). The commitment-trust theory is introduced by Morgan and Hunt (1994). It consists of two primary components that ensure the long-term relationship between business and customers: trust and relationship commitment. The CTT model has been tested and applied in economics, psychology, and sociology. The original CCT model is complex, prompting a modified commitment-trust theory model by Mira et al. (2013).

Hypothesis Development and Model Design

Perceived usefulness

Davis (1989) defines perceived usefulness as the subjective perception of the overall performance associated with specific technology. Sugandini et al. (2018) emphasize the significance of perceived usefulness in evaluating technology adoption, which also influences individuals' attitudes and adoption levels towards new technology. In this study, we examine the perceived usefulness to investigate its substantial impact on behavioral intention towards new technology systems. Fidriani et. al. (2019) describe subjective norms as individuals' perception of what they should or should not do, influenced by social pressure. According to their findings, subjective norms directly influence perceived usefulness. On the other hand, result demonstrability refers to the specific outcomes that users consider after utilizing an information system (Ming et al., 2021). The study found that result demonstrability has a significantly positive effect on perceived usefulness. Similarly, Elshafey et al. (2020) establish that result demonstrability can be explained as the tangibility of innovation outcomes, directly impacting perceived usefulness. Therefore, the following hypotheses are proposed in this study:

Hypothesis$_1$ (H_1): There is a significant relationship between subjective norms and perceived usefulness.

Hypothesis$_2$ (H_2): There is a significant relationship between result demonstrability and perceived usefulness.

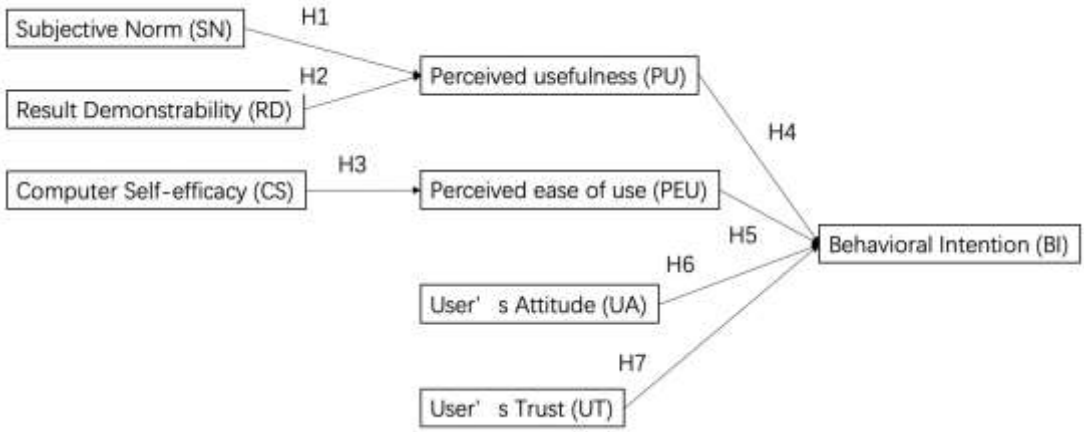
Hypothesis$_4$ (H_4): There is a significant relationship between perceived usefulness and user's behavioral intention in using the DC/EP.

Perceived ease of use

Nadeem et. al. (2021) in their study on investigating adoption factors of cryptocurrency, defines perceived ease of use as the affect the consumers' decision. When they perceive Internet devices and tools as easily operable, their attitude towards buying online products can be easily developed. In another study regarding teacher's intention to use online learning system by Ngabiyanto, et al. (2021), perceived ease of use is an essential factor affecting teachers' intention to use online learning system. There are two determinants of perceived ease of use: 1) computer self-efficacy and 2) computer anxiety which will be tested in this research. Sriningsih, et al. (2018), define computer self-efficacy as an individual's ability to study computers where they examine the impact of computer self-efficacy and other variables related to computer use on user's attitudes to use computer. Their finding shows that computer self-efficacy significantly impacts perceived ease of use. In relation to computer anxiety, Aygul and Merve (2019) define it as the human body's natural reaction to stress where they reveal a significant correlation between perceived usefulness and anxiety. Therefore, computer anxiety is a potential negative antecedent of technology acceptance model. Thus, the hypotheses which are related to perceived ease of use in this could be proposed as follows:

Hypothesis$_3$ (H_3): There is a significant relationship between computer self-efficacy and perceived ease of use.
Hypothesis$_5$ (H_5): There is a significant relationship between perceived ease of use and user's behavioral intention in using the DC/EP.

Figure 1: Research model



User's Attitude

Based on earlier discussion, Ajzen and Fishbein's (1980) Theory of Planned Behavior demonstrated the relationship between attitude, intention, and behaviour. An individual's behaviour is affected by their intention where this self-intention is affected by personal attitude. The TPB model also stipulates that an individual's behavior is directly related to perceived behavioural control associated with perceived power that hinders or improves behavioural intention performance. In a non-stress situation, an indirect relationship exists between attitude and behaviour because an individual has enough time and motivation to affect attitude (Warshaw, et al., 1983). According to the study of belief, attitude, intention, and behaviour by Fishbein and Ajzen (1975), attitude is the feeling with evaluative impact of positive or negative. If an individual has positive attitude, they would be performing behaviour driven by the power of intention. Attitude is determined by an individual's behavioural beliefs, that weighted by the evaluation to the outcome of individual. In this study, user's intention towards using DC/EP is determined by user's attitude, leading to the following hypothesis:
Hypothesis$_6$ (H_6): There is a significant relationship between attitude and and user's behavioral intention in using the DC/EP.

User's Trust

The concept of trust is studied in many fields, especially regarding confidence in mobile device use concerning online transactions. Trust is the confidence to use new technology where a low degree of perceived trust would reduce the adoption and satisfaction of new technology. This reduction negatively impacts the intention to use new technology. For Ishaq and Khadra (2012), trust is related to customer's confidence and sufficient regulation, indicating the significant and strong effect of trust on user intention towards internet banking. Koksal and Penez (2015) consider trust a subjective opinion of the user's confidence to secure new technology services where security mechanisms would heavily protect the transaction. The

Trust Services Management Section of the digital currency operation system is providing an interface of issuing certificates related to digital currency besides providing a secure payment channel for all digital currency transactions. This module is derived from the technology of cloud computing. Using this professional management system, it can provide the functions of application issuance and management as well as authentication of digital currency applications by all parties (Sunrye, 2019). By generating the advantage of cash and digital currency, the DC/EP has the same functions with cash. During the payment, the merchants can refuse to accept payment methods such as WeChat Pay or Alipay, but they cannot refuse to accept DC/EP. Therefore, the relationship between commitment and user's trust is hypothesise as:

Hypothesis$_7$ (H_7): There is a significant relationship between trust and user's behavioral intention in using the DC/EP.

Methodology

The sample comprises Chinese residents who previously utilized the DC/EP during China's pilot stage. The questionnaire is divided into three sections, each containing a total of 54 questions pertaining to personal information, preferences for digital currency electronic payment, and the determinants to adopt the DC/EP: perceived usefulness, perceived ease of use, user's attitude, and trust. Respondents indicated their level of agreement on a "Likert scale" ranging from (1) Strongly Disagree to (5) Strongly Agree (Likert, 1932; Norman, 2010). By employing the convenience sampling technique, data was collected through an online questionnaire distributed via WeChat groups and other Chinese social media platforms using the "Wenjuan Xing" (Questionnaire Star).

A total of 392 valid responses were obtained. The data was analyzed using the Structural Equation Modeling (SEM) - Partial Least Squares (PLS) approach. Firstly, the data was coded and entered using the statistical software SPSS version 28. It was then transferred to SMART-PLS software version 3.0 to test the hypothesized relationships. The significance levels for loadings, weights, and path coefficients were determined using a bootstrapping method with 5,000 re-samples.

Results and analysis

The distribution of samples among gender are almost equal, with slightly more than half of the respondents were female. In terms of age range, most of the DC/EP users are between 18 to 24 years old (84.7%) and majority (98%) stated their preference to the use mobile payment services instead of cash. This came as no surpise as according to previous studies, the millennials are a generation extensively exposed to evolving technologies, particularly mobile devices. Additionally, they have the highest level of mobile internet penetration, as indicated by Statista (2016) in Chuah et al. (2017).

Table 1:
Demographic Charactiristics of the samples (n= 392)

Level	Frequency	Percentage
Gender		
Male	175	44.7%
Female	217	55.4%
Age		
< 18 years	17	4.3%
18-24	332	84.7%
25-50	38	9.7%
> 50 years	5	1.3%
Preference of using mobile payments		
Yes	384	98%
No	8	2%
Frequency of using mobile payments		
1 - 7 times	33	8.4%
7 - 14 times	67	17.1%
15 – 30 times	93	23.7%
> 30 times	199	50.8%

The process of data analysis commences by conducting tests to ensure the validity and reliability of the data. Table 2 shows the results of the measurement model. The convergence validity test, as outlined in Hair et al. (2010), involves calculating factor loadings, composite reliability, and average variance extracted (AVE). First, the outer loadings are essential to evaluate the extent of consistency of the indicators. Based on Taylor and Geldenhys (2019), the outer loading of 0.7 and above are highly satisfactory, and the outer loading of 0.5 or higher are considered acceptable. The outer loadings of this study are all higher than 0.5, which is considered acceptable.

The Average Variance Extracted (AVE) and Composite Reliability (CR) are also important in validity analysis. Normally, the general requirement of acceptable value of AVE is 0.5 and the acceptance value of composite reliability value is 0.7 and above (Fomell and Larcker, 1981). AVE values from this study are between the range of 0.597 to 0.765, hence providing further evidence of convergent reliability. Meanwhile, the composite reliability values are all above 0.7, ranging between 0.787 to 0.884 which indicate good internal consistency of the latent construct and considered acceptable.

Table 2:
Measurement model

Latent Variables	Indicators	Loadings	Composite reliability	AVE
Behavioral Intention	BI 1	0.802	0.868	0.597
	BI 2	0.719		
	BI 3	0.860		
	BI 4	0.763		
	BI 5	0.760		
	BI 6	0.701		
Computer Self-Efficacy	CS 1	0.873	0.867	0.648
	CS 2	0.851		
	CS 3	0.772		
	CS 4	0.726		
	CS 5	0.751		
Perceived Ease of Use	PEU 1	0.747	0.884	0.628
	PEU 2	0.792		
	PEU 3	0.744		
	PEU 4	0.781		
	PEU 5	0.731		
	PEU 6	0.884		
Perceived Usefulness	PU 3	0.751	0.860	0.700
	PU 4	0.850		
	PU 5	0.855		
	PU	0.872		
Result Demonstrability	RD 2	0.793	0.787	0.694
	RD 3	0.912		
	RD 5	0.781		
Subjecitve Norms	SN 1	0.846	0.852	0.765
	SN 2	0.905		
	SN 3	0.872		
User's Attitude	UA 2	0.717	0.833	0.599
	UA 3	0.803		
	UA 4	0.774		
	UA 5	0.745		
	UA 6	0.807		
User's Trust	UT 1	0.781	0.796	0.619
	UT 2	0.820		
	UT 3	0.794		
	UT 4	0.743		

Table 3:
Fornell-Larcker Criterion

	BI	CS	PEU	PU	RD	SN	UA	UT
BI	0.773							
CS	0.637	0.805						
PEU	0.623	0.770	0.793					
PU	0.537	0.544	0.564	0.836				
RD	0.597	0.637	0.730	0.663	0.833			
SN	0.434	0.418	0.412	0.516	0.447	0.875		
UA	0.710	0.603	0.616	0.473	0.577	0.371	0.774	
UT	0.658	0.612	0.569	0.411	0.522	0.320	0.693	0.787

The discriminant validity analysis can be achieved by comparing the AVE square root and correlation coefficient. The AVE square root value can represent the aggregation of the factor, and the correlation coefficient represents the correlation. If the factor has a strong aggregation, it can indicate that it has good discriminant validity. A Fornell-Larcker (1981) assessment shows the square root of AVE in Table 3 above, which represents the aggregation of factors. In general, based on the results from Smart-PLS, the factors in this research have good discriminant validity.

Figure 2: PLS-SEM Structure

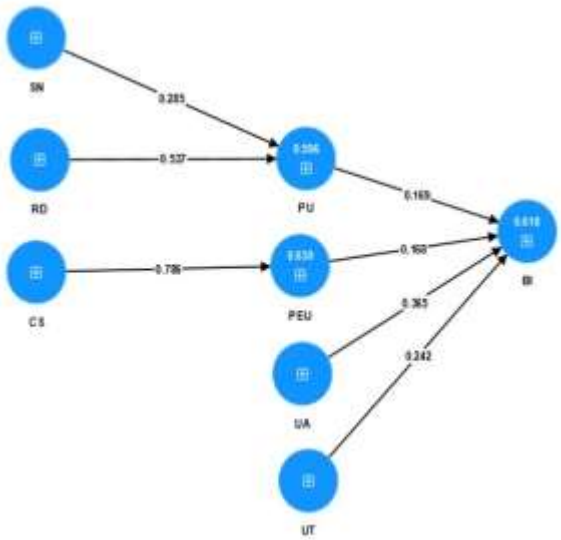


Table 4:
The Path Coefficient

Path	T-statistics	VIF	Results
Subjective norms -> perceived usefulness	5.849	2.128	Supported
Result demonstrability -> perceived usefulness	11.983	1.694	Supported
Computer self-efficacy -> perceived ease of use	26.173	1.911	Supported
Perceived usefulness -> behavioral intention	3.212	2.010	Supported
Perceived ease of use -> behavioral intention	2.586	2.024	Supported
User's attitude -> behavioral intention	4.961	1.729	Supported
User's trust -> behavioral intention	4.843	1.640	Supported

Figure 2 and Table 4 shows the result of the structural model from the PLS output. The value of VIF is all less than 5, which means that there is no collinearity issue existing in the research model. Based on the path coefficient results, the hypotheses developed for this study can be summarised as following:

Hypothesis 1: There is a significant relationship between subjective norms and perceived usefulness.
The T statistics for subjective norms and perceived usefulness is 5.849 ($p<0.001$) and therefore, Hypothesis 1 is accepted.
Hypothesis 2: There is a significant relationship between result demonstrability and perceived usefulness.
The T statistics for result demonstrability and perceived usefulness is 11.983 ($p<0.001$) and therefore, Hypothesis 2 is accepted.
Hypothesis 3: There is a significant relationship between computer self-efficacy and perceived ease of use.
The T statistics for computer self-efficacy and perceived usefulness is 26.173 ($p<0.001$) and therefore, Hypothesis 3 is accepted.
Hypothesis 4: There is a significant relationship between perceived usefulness and user's behavioral intention.
The T statistics for perceived usefulness and user's behavioral intention is 3.212 ($p<0.001$) and therefore, Hypothesis 4 is accepted.
Hypothesis 5: There is a significant relationship between perceived ease of use and user's behavioral intention.
The T statistics for perceived ease of use and user's behavioral intention is 2.586 ($p<0.001$) and therefore, Hypothesis 5 is accepted.
Hypothesis 6: There is a significant relationship between user's attitude and and behavioral intention.
The T statistics for user's attitude and behavioral intention is 4.961 ($p<0.001$) and therefore, Hypothesis 6 is accepted.
Hypothesis 7: **There is a significant relationship between user's trust and behavioral intention.**
The T statistics for user's trust and behavioral intention is 4.843 ($p<0.001$) and therefore, Hypothesis 7 is accepted.

Discussion
The perceived usefulness in this study is related to the subjective perception to general performance of DC/EP. If the users can get benefits when using DC/EP, they would consider

using it in next time. On the contrary, if users have bad impression of using DC/EP, that they would never use it again. Thus, the user's intention to use DC/EP is attracted by the beneficial and general performance of DC/EP (Ula, et al., 2021; Aji, et al., 2020). Besides that, the subjective norm and result demonstrability are both significantly associated with perceived usefulness. This indicates that, respondents' intention to use the DC/EP is significantly influenced by social influences, which are sourced from family, friends, and colleagues (Ham, et al., 2015). Thus, the commends from social norms will stimulate potential users to use DC/EP. Other than that, the characteristics of tangible and observable of DC/EP are showing the result demonstrability (Gow, et al., 2019; Venkatesh and Bala, 2008).

Computer self-efficacy was found to be significantly associated with perceived ease of use. In this study, the computer self-efficacy is referring to the personal ability to use DC/EP (Sriningsih, et al., 2018; John, 2013). Majority of the respondents perceived that they could complete the transaction easily that DC/EP users are proficiency in processing mobile payments. So far, the mobile payment methods have covered most of business activities. Thus, most of Chinese residents are skilled at using mobile payment applications, so that it would be easy to learn how to use DC/EP by their computer skills. However, as shown in the result, the computer anxiety is not significantly associated with perceived ease of use, which means that users are not fear to use DC/EP. It's a reasonable result, because users are used to the concept of digital currency and electronic payment methods.

Moreover, there is a significant relationship between commitment and user's trust, which means that the users are confident to use DC/EP, and it has been used to conduct mobile transactions already. If DC/EP can protect the privacy of users and solve the security issues, that it would maintain a long-term trust relationship with users (Rehman, et al., 2019; Mukherjee and Nath, 2007). Furthermore, most of respondents trust the commitment made by DC/EP, which are the function of DC/EP and security of application. For example, the function of DC/EP is easy to access and beneficial to users. What's more, the DC/EP application is operating under the monitoring by the Central Bank of China, that it would be hard to be hacked by others. The user's account is protected by the cryptographic technique. Thus, the commitment is highly affecting user's behavioral intention in this study.

Conclusion

In a digitally transformed society, the development of Central Bank Digital Currency (CBDC) emerges as the prevailing trend for the future of digital currency worldwide. The misuse of unconventional digital currency can harm the domestic economy. Since 2014, the People's Bank of China has established a research group dedicated to developing DC/EP (Digital Currency/Electronic Payment). Continuous optimization of mechanisms and pilot testing is crucial to promote DC/EP in the Chinese market. This study aims to investigate the influential factors determining the adoption of DC/EP in China. Particularly, the findings reveal that user's trust, attitude, perceived usefulness, and perceived ease of use are significantly associated with user's behavioral intention to use the DC/EP**.** Furthermore, the results indicate a significant and positive association between subjective norm and result demonstrability with perceived usefulness. Additionally, computer self-efficacy is significantly associated with perceived usefulness. Ultimately, future research should focus on the post-implementation phase of DC/EP in China. Once people have a comprehensive understanding of DC/EP applications, determining the factors influencing the adoption of DC/EP in China can be finalized using a comprehensive sample. This study offers several theoretical contributions. Firstly, it presents an in-depth introduction to the mechanism and application of the DC/EP,

providing readers with insights into the central bank of China's intentions in promoting DC/EP and the key factors influencing its adoption in practical scenarios. Moreover, the study addresses a research gap concerning the acceptance of DC/EP in China, thereby enriching the academic foundation for future digital renminbi development.

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