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Individuals' attitudes and their adoption intentions of central bank digital currency: Combining theories and analytics for deeper insights

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ABSTRACT

Leveraging a multi-theoretical and multi-method approach, this study investigated the factors influencing individuals' attitudes and intentions towards adopting central bank digital currency (CBDC). Data from Nigeria, a pioneering CBDC nation, were analysed using partial least squares structural equation modelling, which revealed that affordance-based positive valences, including seamless transactions, time convenience, and the societal positive valence of financial inclusion, are the strongest predictors of positive attitudes and, subsequently, usage intentions. Perceived financial cost emerged as the most significant barrier. Lifestyle compatibility demonstrated a moderate positive association with attitude. Further, fuzzy-set qualitative comparative analysis identified four necessary conditions for high usage intentions: seamless transactions, trust in the central bank, positive attitude, and the societal positive valence of financial inclusion. Additionally, six alternative configurations sufficient for high usage intentions were also revealed. These findings offer valuable insights for both theoretical research and policymakers, informing strategies to facilitate early CBDC adoption.

1. Introduction

> 'Adoption of CBDCs is nowhere close. But about 60 percent of countries are exploring them in some form today…Country authorities wishing to introduce CBDCs may need to think a little more like entrepreneurs. Communication strategies, and incentives for distribution, integration, and adoption, are as important as design considerations.' Keynote address by Kristalina Georgeiva (Managing Director, IMF) in the Singapore Fintech Festival, November 2023.

The potential of blockchain technology to democratise financial services, enhance payment system efficiency, and streamline cross-border transfers by reducing costs and burdens has prompted central banks to consider central bank digital currencies (CBDCs) as a viable solution (Agur et al., 2022; Auer and Böhme, 2020; Central Bank of Nigeria [CBN], 2021; Ozili, 2023b). CBDC is an electronic form of payment issued by a central bank. It represents a digital equivalent of physical cash, where the central bank holds the liability (Ozili, 2024; Williamson, 2022). As Barrdear and Kumhof (2022) highlighted, CBDCs offer universal, electronic, and round-the-clock access to a nation's currency. It is widely acknowledged that numerous countries are considering the launch of their CBDCs, thus drawing significant global attention (Claessens et al., 2024).

However, the critical question remains: are individuals prepared to embrace this digital fiat currency? This inquiry is particularly relevant in developing nations such as Nigeria, which launched its own CBDC, the eNaira, in late 2021, thus establishing itself as a pioneer in the field (Ozili, 2023a). Addressing this question is vital within the emerging domain of CBDC research, which has predominantly focused on their potential macroeconomic implications and the challenges of policy implementation (Agur et al., 2022; Andolfatto, 2021; Auer, 2019; Auer and Böhme, 2020; Bordo and Levin, 2017; Wang et al., 2022b). Understanding the readiness of individuals to adopt CBDCs can provide

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researchers valuable insights into their broader societal acceptance and practical viability. This understanding is crucial to ensure an effective transition to CBDCs.

Tronnier et al. (2023) acknowledged the scarcity of research focusing on the future users of CBDCs, noting, "Research that focuses on the future user of a CBDC is scarce, which is surprising as the success or failure of the implementation of a CBDC will ultimately depend on users' attitudes towards a CBDC and their usage of it" (p. 13). This statement underscores the need for more research in this area to ensure the successful implementation of CBDCs (see Wang et al., 2023). Indeed, a similar call for more comprehensive investigations into the factors influencing CBDC adoption can be found in the works of Bhaskar et al. (2022), Gupta et al. (2023), Kim et al. (2023), and Ogunmola and Das (2024).

Notably, an early investigation by Söilen and Benhayoun (2022) identified performance expectations, social influence, facilitating conditions, and trust in the digital currency system as the primary predictors of CBDC usage intentions. However, this research largely neglected the potential impediments to CBDC adoption, such as perceived risks and cognitive effort. However, Gupta et al. (2023) examined both the perceived benefits and risks concerning the adoption of India's digital Rupee, determining that the perceived risks may outweigh the perceived benefits in adoption decisions (see also Ma et al., 2022). Further, Kim et al. (2023) underscored the importance of perceived risks to find that performance, financial, and time concerns negatively impacted tourists' willingness to use CBDC for tourism payments.

Despite these insights, a considerable research gap persists due to the insufficient exploration of both the drivers promoting and the constraints hindering early CBDC adoption. Moreover, most existing studies are based on data from countries yet to formally launch CBDCs, which is in sharp contrast to the present study's focus on early CBDC pioneers, particularly Nigeria.

Interestingly, Nigeria, despite being a CBDC pioneer with over two years of implementation, has seen <2 % of its population actively using its eNaira (RegTech Africa, 2023; Ree, 2023), highlighting a significant research gap in understanding individual attitudes and intentions towards CBDC within the Nigerian context. Given this discrepancy between the eNaira's early adoption and low usage, it is essential to investigate the specific factors influencing CBDC uptake in Nigeria. To date, no research has directly explored individuals' attitudes and intentions to use CBDC in Nigeria, making this study crucial for understanding the specific factors influencing CBDC adoption in Nigeria.

Another limitation of the available literature on CBDC adoption is its overreliance on single theoretical frameworks, which may limit our comprehension of the intricate decision-making processes that individuals undergo when considering CBDC adoption. Therefore, this study addresses this gap by developing an integrative research model that combines the valence framework (Peter and Tarpey Sr, 1975), social cognitive theory (SCT) (Bandura, 1989, 2005), and the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980; Fishbein, 1980). By combining these theories (see Fig. 1), this study aimed to provide a comprehensive picture of the factors influencing CBDC attitudes and usage intentions, considering both affordance-based positive valences and constraint-based negative valences (valence framework), lifestyle compatibility and trust in the central bank (SCT), and subjective norms/attitudes (TRA). The insight gained from this approach would enable central banks and media partners to create effective advertising campaigns that encourage initial CBDC acceptance.

Furthermore, recent research has called for integrating traditional statistical methods with newer analytical approaches to better understand complex topics such as CBDC adoption (Loh et al., 2023; McLeay et al., 2022; Yee et al., 2021). Responding to this call, we adopted a multi-method approach that utilised both partial least squares structural equation modelling (PLS-SEM) and fuzzy-set qualitative comparative analysis (fsQCA), which allowed us to probe further into the decision-making process behind CBDC adoption and, in turn, provide valuable insights that can guide policymakers, such as central banks, in promoting early CBDC adoption.

Our study, therefore, represents a novel contribution not only to CBDC research but also to the fields of financial technology (fintech) and consumer adoption, reflecting a significant methodological advancement in these fields. By combining multiple theories and methods, our study unpacks the factors influencing individuals' attitudes and intentions towards CBDC adoption. Further, conducted in one of the pioneering countries of CBDC, i.e., Nigeria, our study is both relevant and timely.

The remainder of this paper is organised as follows: Section 2 presents a detailed literature review, the theoretical foundations of the study, and hypothesis development. Section 3 outlines our research methodology. Section 4 presents the study's findings based on PLS-SEM

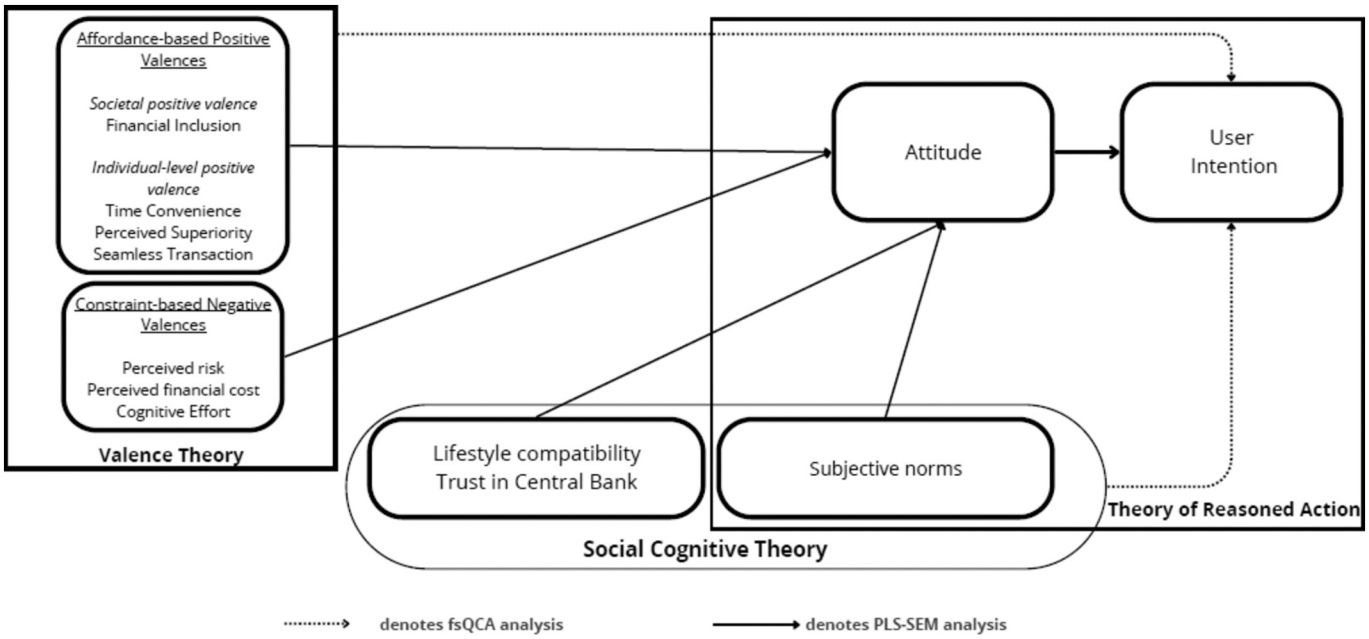


Fig. 1. Proposed research model.

and fsQCA. Finally, Section 5 discusses the implications of these findings for research and policy, future research directions, and study limitations.

2. Literature review

2.1. Financial technology (FinTech)

The rapid innovation of fintech has garnered significant attention from scholars, industry practitioners, and policymakers due to its role in empowering individuals and society (Chorzempa and Huang, 2022). Fintech, as defined by Lagna and Ravishankar (2022), refers to the application of technological innovations to support or enable financial services. The advantages of fintech include increased transparency, improved accessibility to information, reduced costs, and the elimination of intermediaries (Zavolokina et al., 2016).

For fintech companies to succeed, they must balance the potential benefits with perceived costs and risks. This balance is essential, as greater perceived benefits and reduced risks can foster positive user attitudes and drive fintech adoption (Chan, 2015; Gupta et al., 2023; Pal et al., 2021; Ryu, 2018), whereas neglecting risks or failing to deliver promised benefits can undermine trust and hinder adoption. In Korea, Ryu's (2018) study on fintech, involving 243 users, found that convenience had the most significant positive impact on the intention to continue using fintech, while legal risk had the most detrimental impact. Additionally, supply-side factors such as policy reforms and regulatory mechanisms play a significant role in mitigating risks associated with financial innovation (Auer, 2019; Chorzempa and Huang, 2022).

Meanwhile, the evolution of fintech has also intensified competition among banks and fostered collaboration between traditional financial service providers and fintech startups (Harasim, 2021). A study by Murinde et al. (2022), which spanned 16 years and involved data from 115 countries, found that fintech lenders are unlikely to replace banks as banks are increasingly developing their fintech platforms and collaborating with fintech startups.

Ultimately, the long-term success of fintech depends not only on financial institutions or regulators but also on individuals and businesses. This study, therefore, focused on understanding potential adopters by examining their perceptions of CBDC to form a comprehensive view of their attitudes and acceptance intentions towards CBDC.

2.2. Central bank digital currency (CBDC)

A CBDC refers to any type of fiat electronic central bank liability used as a store of value or for settling payments (Agur et al., 2022; Söilen and Benhayoun, 2022; Wang et al., 2022b). It falls within the category of electronic narrow money (Meaning et al., 2018). While CBDC wallets are similar to established fintech platforms such as PayPal, they are also fundamentally distinct. Unlike PayPal, which predominantly facilitates online payment transactions and lacks legal tender status, CBDC serves as a digital representation of fiat currency and possesses legal tender recognition.

Previous studies on CBDC have discussed the experiences of "early adopters" and how they can benefit the financial sectors (Bordo and Levin, 2017). In this respect, Boar and Wehrli (2021) revealed that just 10 % of surveyed central banks anticipate issuing CBDCs for individuals, such as the eNaira in the context of this study.

Researchers have argued that using CBDC provides several potential benefits: eliminating expenses associated with physical cash handling, such as high storage fees (Gnan and Masciandaro, 2018); promoting economic and price stability (Barrdear and Kumhof, 2016); increasing public welfare (Williamson, 2022); and reducing reliance on private bank funding while facilitating narrow banking (Auer, 2019). Nevertheless, costs associated with using CBDCs remain a contested topic. For example, in some countries, the financial sector and banks' political opposition can be attributed to their concerns about the uncertainty of the costs and time needed for CBDC adoption, which could be potentially disruptive and slow (Constâncio, 2017; Söilen and Benhayoun, 2022). Such concerns can be mitigated if the interest rate paid for digital currency is appropriately chosen by central banks (Keister and Sanches, 2019) while CBDCs continue to promote lending (Andolfatto, 2021). Simultaneously, some scholars have also argued that CBDC utilisation could have unintended consequences on financial markets, including the volatility of the banking sector and stock markets (cf. Wang et al., 2022b).

Notably, research on CBDC so far has typically focused on CBDC design choices and the potential macroeconomic implications of the technology (Agur et al., 2022; Andolfatto, 2021; Auer, 2019; Auer and Böhme, 2020; Barrdear and Kumhof, 2016; Bordo and Levin, 2017), with limited consideration of individuals' needs and/or perceptions concerning the use of CBDCs (see also related commentary by Bhaskar et al., 2022; Söilen and Benhayoun, 2022; Tronnier et al., 2023).

It is well known that individual adoption of technology is central to the success of the technology itself; hence, research needs to be geared towards understanding the factors influencing voluntary technology adoption (Venkatesh et al., 2003), such as in the case of CBDC. As previously mentioned, previous CBDC studies were more oriented towards investigating technological challenges and the currency system architecture, giving less consideration to factors affecting individual acceptance (e.g., Auer and Böhme, 2020). As such, there is currently very scant understanding of the factors that will either facilitate or undermine individuals' attitudes and their acceptance intentions of CBDCs (Bhaskar et al., 2022; Ogunmola and Das, 2024; Tronnier et al., 2023). The few existing studies in this area include the research conducted by Söilen and Benhayoun (2022), who demonstrated that performance expectancy, social influence, and facilitating conditions are key for the successful individual adoption of CBDCs.

Since CBDCs are still in their nascent stage and only available in a few countries to date (Söilen and Benhayoun, 2022), individuals may base their acceptance of this fintech on a variety of factors, including affordance-based positive and constraint-based negative valences (Gupta et al., 2023; Kim et al., 2023; Lu et al., 2011; Pal et al., 2021; Palash et al., 2022; Tronnier et al., 2023), as well as factors such as lifestyle compatibility (Boateng et al., 2016; Joshi and Chawla, 2023), subjective norms (also known as social influence), and trust (Giménez and Tamajón, 2019; Osakwe et al., 2022a; Söilen and Benhayoun, 2022). Additionally, recent studies have identified that a major advantage of CBDCs is their potential to expand financial inclusion by offering wider access to affordable services for underserved consumers (Bordo and Levin, 2017; Ozili, 2023a; Tronnier et al., 2023). Accordingly, CBDC has a welfare effect considering that it helps facilitate safe and convenient peer-to-peer payments (Auer and Böhme, 2020), which, this study posited, will be one of the affordance-based positive valences driving initial adoption of CBDC through the development of favourable attitudes (also cf. Tronnier et al., 2023).

Relatedly, a Canadian study by Davoodalhosseini (2021) revealed that economic agents prefer to use CBDC over cash when the cost of its usage is not perceived as high. This implies that the perceived cost of CBDC might also be a constraint-based negative valence that could undermine CBDC adoption through the development of an unfavourable attitude towards CBDC use. Similarly, perceived risk as a constraint-based negative valence (Pal et al., 2021) has also been argued to undermine individuals' attitudinal and behavioural predispositions towards CBDC adoption (Gupta et al., 2023; Kim et al., 2023; Ma et al., 2022).

Moreover, beyond positive and negative valences, scholars such as Söilen and Benhayoun (2022) noted that social recommendations can steer CBDC adoption, especially at this early rollout stage, thus highlighting the importance of studying the specific role of socio-cognitive phenomena such as trust and subjective norms in the early adoption of CBDC. All these provide the impetus for these authors to develop an integrative research perspective that could assist us in unpacking the

numerous perceptions that individuals currently hold about CBDC and, subsequently, their use intentions of CBDC.

2.3. Theoretical foundation and hypotheses development

As previously stated, this research drew upon three distinct theoretical frameworks and their associated constructs: the valence framework (Peter and Tarpey Sr, 1975), SCT (Bandura, 1989), and TRA (Ajzen and Fishbein, 1980; Fishbein, 1980). The utilisation of the valence framework within the CBDC context elucidates how individuals assessing a new technology weigh its positive and negative aspects. Thus, theories that encompass both positive and negative dimensions in analysing consumer decision-making align with the objectives of this research. Consequently, we employ the valence framework, which is rooted in economics and psychology, to explore how consumer decision-making in the CBDC context is shaped by potential benefits (or affordance-based positive valences) and perceived constraints. Peter and Tarpey Sr (1975) explored three consumer decision-making models based on the valence framework: the expected net utility model (e.g., perceived net return), the expected positive utility model (e.g., perceived return/benefit), and the expected negative utility model (e.g., perceived risk). They theorised that consumers perceive both positive and negative consequences of transactions, aiming to minimise negative utility, maximise positive utility, and optimise their overall net utility. Thus, the valence framework, which considers both uncertainties and perceived benefits as fundamental factors influencing consumer behaviour, is superior to models that only examine the positive or negative consequences of transactions. By accounting for a wide range of benefits and uncertainties, the valence framework offers a more comprehensive understanding of how perceptions of positive and negative outcomes influence consumer decision-making (Peter and Tarpey Sr, 1975). Hence, recognising the need to broaden the scope of CBDC adoption research, this study drew upon valence theory to explore the understudied role of positive and negative valences in individual decision-making towards CBDC. This approach aligns with previous research in fintech (Lu et al., 2011; Pal et al., 2021; Palash et al., 2022).

The second theoretical framework utilised in this work is SCT, proposed by Bandura (1989). SCT is highly relevant for studying human behaviour as it emphasises the interplay among individual behaviour, cognition, and the environment. It highlights the effects of socio-environmental and personal cognitive factors such as social influence, trust in the central banks, and lifestyle compatibility on behaviour. The social cognitive aspect is particularly concerned with how individuals perceive themselves and their social world, which, in turn, shapes their judgments and decisions (Bandura, 2005).

Specifically, this study adopted SCT due to its relevance in studying attitudes towards technology use (Boateng et al., 2016; Kimiagari and Baei, 2024; Osakwe et al., 2022b). Besides, SCT has garnered empirical support in the wider literature (Demirel, 2022; Lin and Hsu, 2015; Ng and Lucianetti, 2016; Tang et al., 2016; Wu et al., 2022).

The third theoretical perspective employed in this study is TRA (Ajzen and Fishbein, 1980). TRA posits that behaviour is driven by intentions, which are influenced by attitudes and shaped by subjective norms. This theory has demonstrated significant predictive power in various studies (Ng, 2023; Park, 2000; Sheppard et al., 1988) and is particularly relevant in the context of technology adoption research (Choi et al., 2014; Featherman et al., 2021; Wang et al., 2022a).

Thus, by integrating the valence theory, SCT, and TRA to explore individuals' attitudes and usage intentions towards CBDC, this study aimed to identify potential affordance-based positive valences of CBDC (e.g., seamless transactions) and constraint-based negative valences (perceived risk, financial cost, cognitive effort). Further, it also considered SCT-related concepts (i.e., trust in the central bank, lifestyle compatibility, and subjective norms) in shaping CBDC adoption. This study pioneers the integration of these influential theoretical perspectives within fintech research and CBDC investigation, offering a comprehensive framework for understanding the factors influencing CBDC adoption.

2.3.1. Affordance-based positive valences related to CBDC use

Given that fintech users are primarily seeking positive valences, particularly in the form of utilitarian benefits rather than hedonic advantages (Jain and Raman, 2022; Lu et al., 2011; Ryu, 2018), we identified four affordance-based positive valences of CBDC: societal-related benefits (i.e., financial inclusion) and individual-related benefits of seamless transactions, perceived superiority, and time convenience, as discussed below.

2.3.1.1. Financial inclusion. Financial inclusion is a societal benefit related to the overall availability, accessibility, and ease of use of the formal financial system for individuals and households (Lagna and Ravishankar, 2022; Sahay et al., 2015). Building on evidence that mobile money enhances financial inclusion by increasing accessibility, usage, and affordability of financial services (Bongomin et al., 2018; Jahan et al., 2019), we proposed that the potential for CBDC to drive similar inclusion might motivate user adoption. Existing research suggests that financial inclusion benefits, such as improved livelihoods, economic opportunities, and societal prosperity, can positively influence mobile money adoption (Teutio et al., 2023). Similarly, in the Chinese context, perceptions of the societal benefits of CBDCs have been found to stimulate individuals' willingness to use the currency (Wang et al., 2023). Against this backdrop, we hypothesised that in low- and middle-income countries such as Nigeria, where financial exclusion is prevalent (Sahay et al., 2015), individuals may develop positive attitudes towards CBDC adoption due to its potential to expand financial access and reduce reliance on high-cost alternatives (Foster et al., 2021; Ozili, 2023a). Hence, the following hypothesis can be articulated:

H1. The potential societal benefit of CBDC, as encapsulated by financial inclusion, will be positively associated with individual attitudes towards CBDC.

2.3.1.2. Seamless transaction. Seamless transactions, defined as "the transaction-related benefit of using Fintech (e.g., buying, money transferring, lending, and investing)" (Ryu, 2018, p. 547), are increasingly prioritised by financial institutions to meet user expectations. In other words, seamless transactions connote speedy transactions, such that it is expected that the use of CBDC will lead to secure and rapid transactions, without the need for a middleman such as a bank agent. While studies have suggested that seamlessness alone may not be the strongest motivator for initial adoption, as users often expect such features (Jain and Raman, 2022), Ryu (2018) highlighted a strong association between seamless transactions and perceived benefits, which, in turn, drive adoption intention. Furthering this point, Huang et al. (2023) argued that, in the context of virtual currencies, seamless transactions "are likely to enhance the user's positive attitude toward the use of the cryptocurrency" (p. 576). This aligned with our focus on exploring the link between seamless CBDC transactions and individual attitudes. Accordingly, we postulated that individuals perceiving CBDC as offering such smooth and effortless experiences would be more likely to develop favourable attitudes towards its use. Hence, the following hypothesis can be articulated:

H2. Seamless CBDC transactions will be positively associated with individual attitudes towards CBDC.

2.3.1.3. Perceived Superiority. Perceived superiority has been defined by Xu et al. (2017) as "the degree to which a consumer believes novel and superior contents are embodied in the new technology generation when compared with previous technology generations" (p. 111). This suggests that the perceived superiority of a technology can be characterised by improvements in technological features, capabilities, and

other relative advantages (Rogers, 1995; Xu et al., 2017). Given its foundation in blockchain technology, CBDC might be perceived as superior to other alternatives such as paper money, mobile money, PayPal, and SMS banking by individuals who may be relatively knowledgeable in both established and emerging technologies. This perception could be influenced by the central bank's direct control over CBDC, a stark contrast to the volatility of conventional digital currencies like Bitcoin. Consequently, these individuals might anticipate greater relative advantages from CBDC use, leading to positive attitudes towards its adoption. Thus, the following hypothesis can be articulated:

H3. Perceived superiority of CBDC will be positively associated with individual attitudes towards CBDC.

2.3.1.4. Time convenience. Time convenience, which reflects minimal user effort and time spent on financial transactions, has been shown to influence the utilitarian value associated with new technology use (Kleijnen et al., 2007). Time, a valuable resource for both individuals and businesses, cannot be replicated; therefore, services offering time savings gain an edge over others in the marketplace (Newell and Newell-Lemon, 2001). Efficient service delivery – particularly in the form of time convenience – has long been recognised to foster user perceptions of utilitarian value and, consequently, positive attitudes (Childers et al., 2001). Unlike traditional banking systems that rely on intermediaries, CBDCs facilitate instant transactions, enhancing the efficiency of both domestic and international payments (He, 2021). This immediacy benefits all stakeholders, accelerates economic activities, improves cash flow, and reduces the waiting times inherent in traditional banking (Martino, 2021). As a result, CBDC adoption can create a more dynamic and responsive financial ecosystem that meets the demands of the modern digital economy. Therefore, we postulated that the time-saving convenience associated with CBDC transactions would positively influence individuals' attitudes towards its adoption. Thus, the following hypothesis can be articulated:

H4. Time convenience of CBDC will be positively associated with individual attitudes towards CBDC.

2.3.2. Constraint-based negative valences related to CBDC use

2.3.2.1. Cognitive effort. More broadly, cognitive effort encompasses information search (Kleijnen et al., 2007). High cognitive demands, as faced when understanding complex features or navigating unfamiliar technology (Suoranta et al., 2005), act as barriers to technology adoption (Kleijnen et al., 2007). For example, mobile financial services often require significant effort to learn and use (Suoranta et al., 2005). Conversely, studies on mobile services and online shopping demonstrate that reduced cognitive effort leads to positive perceptions of the technology, encouraging adoption decisions (Kleijnen et al., 2007). Thus, we hypothesised that the effort spent acquiring CBDC information would be perceived as a psychological cost, negatively impacting individuals' attitudes towards adoption. Moreover, increased effort spent understanding complex CBDC processes is likely to further undermine their attitudes. Hence, the following hypothesis can be articulated:

H5. Cognitive effort will be negatively associated with individual attitudes towards CBDC.

2.3.2.2. Perceived financial cost. The perceived financial cost, which encompasses transaction fees, service charges, and internet/phone expenses, can hinder technology adoption (Arfi et al., 2021; Teutio et al., 2023). This implies that when potential adopters of CBDC perceive the cost implications as relatively high, they are more likely to develop an unfavourable attitude towards the currency's use. Notably, CBDC's initial implementation and infrastructure costs are higher than those of traditional systems and other means of online payment such as PayPal (Anthony and Michel, 2023). Therefore, consistent with previous studies (Teutio et al., 2023; Zhang et al., 2012), we proposed that high perceived financial costs for CBDC enrolment and usage, especially when its benefits are unclear, would act as a cost burden, thus negatively impacting individuals' attitudes and, ultimately, their intention to adopt CBDC. In sum, the following hypothesis can be articulated:

H6. Perceived financial cost will be negatively associated with individual attitudes towards CBDC.

2.3.2.3. Perceived risk. Perceived risk refers to the individual's uncertainty regarding potential consequences and outcomes involved in using or purchasing a product (Bauer, 1967; Yoo et al., 2020). Risk concerns have been viewed as a factor for CBDC acceptance (Kim et al., 2023) and, consequently, a barrier to the early adoption of CBDC (Gupta et al., 2023). In practice and research, it is understood that perceived risk inhibits individuals from trialling new technologies. Moreover, perceived risk can also explain why rational individuals might choose to evaluate the costs and benefits associated with a technology (Featherman and Pavlou, 2003). Significantly, concerns about personal financial information loss linked to CBDC use, as highlighted by Gupta et al. (2023), constitute a significant risk perception among potential users. Accordingly, Kim et al. (2023) and Ozili (2023a) argued that effective risk mitigation by central banks is necessary for fostering positive perceptions and attitudes towards CBDC adoption. This suggests a strong negative relationship between perceived risk and attitudes towards CBDC use, supported by studies such as that of Kim et al. (2023), as individuals seek to avoid potential financial losses or identity theft associated with security breaches. Against this backdrop, the following hypothesis can be articulated:

H7. Perceived risk will be negatively associated with individual attitudes towards CBDC.

2.3.3. Social cognitive factors associated with CBDC use

2.3.3.1. Lifestyle compatibility. In this study, lifestyle compatibility refers to the extent to which the use of CBDC mirrors the lifestyle and experiences of the individual, ultimately fostering a positive attitude towards CBDC use. More broadly, lifestyle compatibility, akin to the alignment of lifestyle choices and values (Boateng et al., 2016), holds significance in addressing potential uncertainties associated with the integration of technology, specifically concerning a user's values, experiences, lifestyle, and preferences (see also Kimiagari and Baei, 2024; Osakwe et al., 2022b). It has long been recognised that lifestyle compatibility plays a vital role in influencing individual behaviour and confers substantial advantages in predicting consumers' attitudinal and behavioural predispositions. Rogers (1995), for example, acknowledged that the acceptance of an innovation hinges on its compatibility with the user's lifestyle. Furthermore, Armstrong et al. (2014) asserted that individual consumers do not merely decide to purchase a product; they consider the values and lifestyles embodied by the product in question. Following SCT, researchers such as Kimiagari and Baei (2024) and Osakwe et al. (2022b) highlighted lifestyle compatibility as key to shaping technology adoption attitudes (also see Joshi and Chawla, 2023). Moreover, a study by Yoo et al. (2020) validated the positive link between compatibility and attitudes towards Bitcoin use. Based on the preceding discussion, we proposed that attitude towards CBDC in the context of our study would also hinge on how potential adopters of this digital currency perceive it aligns well with their lifestyles, preferences, and values. Hence, the following hypothesis was articulated:

H8. Lifestyle compatibility will be positively associated with individual attitudes towards CBDC.

2.3.3.2. Trust in the central bank. Trust can be broadly defined as a psychological state marked by the belief that a third party (trustee) possesses desirable attributes and will act competently, consistently, and

honestly per agreed-upon expectations (Kim and Peterson, 2017; Söilen and Benhayoun, 2022; Yu et al., 2015). In the context of the present study, the central bank, being the regulator of CBDC and banking-related matters, is the trustee that the public believes will act in their best interest by securing CBDC-enabled transactions. In behavioural research, the role that trust plays in the facilitation of both economic and non-economic transactions has been well documented. For instance, in their meta-analytic study, Kim and Peterson (2017) found that trust is one of the most powerful predictors of attitude. Indeed, scholars (Boateng et al., 2016; Wu et al., 2022) who leveraged SCT as their guiding framework argued that trust acts as a social cognition motivation for individuals' desirable attitudinal and behavioural outcomes, thus implying that increases in trust are associated with favourable outcomes (see also Aziz et al., 2019; Ng and Lucianetti, 2016). Moreover, in the realm of fintech, researchers who investigated the relationship between trust and attitude in emerging markets (such as Ghana, India, Kenya, and Indonesia) have demonstrated that attitude is positively influenced by trust (Laksamana et al., 2023; Ogunmola and Das, 2024; Osakwe et al., 2022a). Further, a substantial portion of these trust issues could stem from a broader scepticism surrounding the central bank's capabilities to allay the fears and mistrust associated with blockchain technology, which often underpins CBDCs (Mazambani, 2024). Despite blockchain's reputation for security, high-profile breaches and vulnerabilities have raised concerns. For instance, aside from security concerns, regulatory uncertainty shrouding the blockchain landscape may contribute to distrust, as the public fears future regulations that could impact the legality of their transactions. Similarly, blockchain technology is not easily understood by the public, which can lead to scepticism, as people tend to mistrust what they do not fully comprehend. Against this backdrop, we conjectured that positive attitudes towards CBDC usage hinge on individuals perceiving the central bank as both trustworthy and aligned with public interests. Conversely, when individuals do not perceive the regulator as a credible and competent institution, their enthusiasm for CBDC adoption diminishes. Consequently, we hypothesised that higher levels of trust in the central bank correlate with more favourable attitudes towards CBDC use. Our proposed hypothesis can be articulated as follows:

H9. Trust in the central bank will be positively associated with individual attitudes towards CBDC.

2.3.3.3. Subjective norms. Subjective norms refer to perceptions of other people's beliefs that stimulate interest in eitherperforming or abstaining from a contemplated behaviour (Ajzen, 1991; Ajzen and Fishbein, 1980). Since individuals are typically embedded within close-knit social networks, they will probably exhibit heightened susceptibility to the opinions of key figures and reference groups such as family and peers (see also Husin et al., 2016; Osakwe et al., 2022a). Drawing from both TRA and SCT, the study anticipated that subjective norms, rooted in the influence of conformity pressure and social endorsement, play an important role in shaping attitudes towards novel technologies, including CBDCs. In other words, evidence from prior research suggests that individuals may exhibit greater receptivity to CBDC adoption when encouraged by their social circles to explore this technology. However, it is essential to note that studies such as that by Giménez and Tamajón (2019) reported a nonsignificant relationship between subjective norms and attitudes towards digital currency use. Consequently, further investigation is warranted, particularly within the specific context of CBDCs. Nevertheless, by aligning with several previous empirical studies that found a positive association between subjective norms and attitude (e.g., Choi et al., 2014; Osakwe et al., 2022a), we proposed the following hypothesis:

H10. Subjective norms will be positively associated with individual attitudes towards CBDC.

2.3.3.4. Attitude and use intentions. Attitude, which encompasses feelings, beliefs, and behavioural tendencies towards an entity, influences individuals' intentions to engage with it (Ajzen and Fishbein, 1980; Osakwe et al., 2022a, 2022b). Recognising this link, researchers have explored (new) product/service adoption through attitudinal studies (e.g., Huang and Chueh, 2022; Ogunmola and Das, 2024; Osakwe et al., 2022b). Importantly, within the financial services context, positive attitudes towards innovations such as mobile payments and virtual currencies have been demonstrated to promote their adoption (de Luna et al., 2019; Kim et al., 2023; Ogunmola and Das, 2024; Osakwe et al., 2022a; Roh et al., 2022). Therefore, we hypothesised that a stronger positive attitude towards CBDC would correspond to a stronger intention to use it. However, inconsistent findings exist, such as Omar's (2007) study on life insurance in Nigeria, which highlighted the need to further examine the relationship between attitude and CBDC adoption. Hence, the present study investigated whether individuals' attitudes towards CBDC positively influence their usage intentions. Thus, the following hypothesis can be articulated:

H11. Individual attitudes will be positively associated with CBDC use intentions.

As Fig. 1 shows, all the hypotheses mentioned above are summarised in the form of a theoretical model.

3. Methodology

3.1. Study context

Lagos, Nigeria's commercial and financial hub, was selected as the research setting for this study due to its significant economic prominence and cultural diversity. As Africa's seventh largest economy (The Africa Report, 2020; Quartz Africa, 2016) with a population exceeding 20 million (Lagos State Government Ministry of Economic Planning and Budget, 2019), Lagos drives technological innovation in the region. This city's diverse cultural landscape reflects a microcosm of Nigerian society, suggesting that findings from Lagos are likely to be highly generalisable across Nigeria. Therefore, it is an ideal location to investigate individual attitudes and intentions towards adopting CBDC, given its influential role in the national economy and societal structure.

3.2. Data collection and procedure

In this study, a three-pronged approach was utilised for data collection. First, after operationalising constructs based on the literature review, we invited seven experts (comprising two financial service practitioners and five academics) to review the questionnaire. Feedback from these experts improved the questionnaire's clarity.

Second, a pre-test of the questionnaire was conducted at the research site using convenience sampling, involving 40 participants aged 18–55 years. The pre-test yielded reliability scores ranging from 0.5 to 0.8, indicating modest-to-high internal consistency. These initial responses were discarded before the main data collection began. Using an a priori sample size calculator, the minimum required sample size for our model structure was estimated to be 166 (Soper, 2021).

For the main survey, conducted between November 2021 and March 2022, we employed a mixed sampling approach of snowball and convenience sampling, similar to those employed in related studies (e.g., Fakfare et al., 2023). We distributed a total of 350 questionnaires, with an average response time of five days. Notably, for the questionnaires collected on the same day, the completion time averaged approximately 15 min. In total, we received 310 completed questionnaires, resulting in a response rate of 88.5 %. Table 1 presents the demographic profile of the participants.

Table 1
Sample descriptive statistics.

Measure	Item	Frequency	Percent (%)
Gender			
	Female	126	40.6
	Male	181	58.4
	Not specified	3	1.0
Age (years)			
	18–24	30	9.7
	25–34	145	46.8
	35–44	115	37.1
	45–54	16	5.2
	55+	4	1.3
Highest education attainment			
	Secondary school	3	1.0
	Diploma	42	13.5
	Bachelor	226	72.9
	Postgraduate	39	12.6
Job status			
	Self-employed	30	9.7
	Fulltime employed	238	76.8
	Part-time employed	14	4.5
	Currently unemployed	2	0.6
	Retiree	2	0.6
	Student	22	7.1
	Not specified	2	0.6

3.3. Measures

As previously mentioned, the measurement variables utilised in this study were derived from prior research, although they were modified to fit the context of the current investigation. Specifically, financial inclusion was assessed using a three-item scale adapted from the work of Teutio et al. (2023). A sample item for financial inclusion is "I believe that the access to basic financial services provided by central bank digital currency can enhance individuals' access to financial services in society". We measured seamless transactions with a three-item scale derived from the research of Ryu (2018). A sample items for seamless transactions is "I can use various financial services simultaneously (e.g., one-stop processing) when I use central bank digital currency". A four-item scale from Xu et al. (2017) was employed to measure perceived superiority. A sample item of perceived superiority is "A central bank-backed digital currency is a breakthrough innovation compared to other forms of currency, including banknotes and coins". We measured time convenience using a three-item scale adapted from Kleijnen et al. (2007). A sample items of time convenience is "Using central bank digital currency would allow me to save time".

Cognitive effort was also measured using a three-item scale adapted from Kleijnen et al. (2007), with items such as "It will take considerable effort to understand how to use central bank digital currency". We assessed perceived financial cost using a four-item scale derived from Arfi et al. (2021) and Teutio et al. (2023), with items such as "Signing up for and using central bank digital currency could be relatively expensive". Perceived risk was measured using a four-item scale adapted from Featherman and Pavlou (2003), with items such as "Compared to conventional currencies (e.g., banknotes and coins), I believe that using central bank digital currency is riskier".

Lifestyle compatibility was measured using a three-item scale adapted from two earlier studies (Boateng et al., 2016; Kleijnen et al., 2007), with items such as "The use of central bank digital currency aligns with my financial service preferences". We measured trust in the central bank using a four-item scale adapted from Osakwe et al. (2020), with a sample item being "Overall, the Central Bank of Nigeria will do everything to secure digital currency transactions for users". We assessed subjective norms based on a three-item scale adapted from the work of Husin et al. (2016) and Osakwe et al. (2022a), with items such as "People close to me may influence my decision to use central bank digital currency".

For the dependent variables in our PLS-SEM analysis, we utilised a three-item scale to measure attitudes towards CBDC, adapted from Aziz et al. (2019). A sample items for attitude is "In general, I highly regard the idea of using central bank digital currency". Finally, we employed a three-item scale to measure use intentions, adapted from Venkatesh et al. (2003). A sample item for use intentions is "Overall, I am likely to use central bank digital currency in the future".

All measurement variables in this study were based on a five-point scale using different anchors such as "strongly disagree" to "strongly agree", "totally disagree" to "totally agree", and "most unlikely" to "most likely". The use of varied scale anchors was also intended to mitigate the incidence of common method bias, which is consistent with the recommendations put forward by Podsakoff et al. (2003).

3.4. Common method bias assessment

Since both dependent and independent variables stemmed from the same questionnaire, common method bias (CMB) posed a potential threat to the validity of our results. We proactively addressed this concern through several measures. First, we assured participant anonymity by emphasising the confidentiality of their responses and informing them that we would only process their aggregate responses. Besides, we did not collect any personally sensitive information from them. Second, the questionnaire clarified that there were no "right" or "wrong" answers to encourage honest responses. Third, we informed participants that participation was voluntary, offered no incentives, obtained consent from all participants. Fourth, we aimed to minimise survey fatigue by keeping questionnaire items concise. Lastly, following established practices (Kock and Lynn, 2012; Pal et al., 2021; Osakwe et al., 2022c, 2020; Roh et al., 2022), we employed two statistical tests to assess CMB: Harman's one-factor test and the full-collinearity lateral (FLA) approach. Harman's one-factor unrotated test indicated a low risk of CMB, as the first factor explained <36.5 % of the variance, which is well below the 50 % threshold. Supporting the absence of CMB further, the FLA approach yielded an average full collinearity variance inflation factor (AFVIF) of 2.045, which is well below the conservative threshold of 3.3 (Kock and Lynn, 2012). This finding suggests that CMB has a negligible impact on the analysis (Pal et al., 2021; Osakwe et al., 2022c, 2020).

3.5. Analytical approaches

Multiple analytical approaches were employed in this study. First, we relied on the factor-based PLS-SEM to test the hypotheses. According to Kock (2019), factor-based PLS-SEM provides relatively more efficient parameters than earlier PLS methods. Most importantly, the use of PLS-SEM has been informed by the exploratory and predictive nature of this investigation and is, therefore, consistent with the work of Hair et al. (2019, 2020). Additionally, given that PLS-SEM is generally more robust at handling data with non-normal distribution, as was the case with our dataset, it was appropriate to apply this statistical method. The software that facilitated our statistical analysis was WarpPLS 8 (Kock, 2022). To complement the PLS-SEM analysis and gain deeper insights into CBDC adoption, we also employed fsQCA. Similar approaches can be found in recent studies such as those by Loh et al. (2023), McLeay et al. (2022), and Yee et al. (2021).

Notably, fsQCA leverages principles of complexity theory to uncover configurations of factors influencing adoption that may remain hidden by regression-based techniques such as PLS-SEM (Fiss, 2011; Pappas and Woodside, 2021; Woodside, 2014; Ragin, 2009). While PLS-SEM excels at analysing the net effects of individual factors, it faces limitations in revealing complex relationships and conditionalities. The results from the two complementary approaches should provide more valuable

insights into the complex decision-making characterising the uptake of CBDC.

4. Results

4.1. Results of hypothesis testing using PLS-SEM

4.1.1. Measurement model

Following Hair et al. (2020), we confirmed that our measurement model meets accepted standards. Specifically, all convergent validity and reliability coefficients surpass the recommended thresholds (see Hair et al., 2020). Detailed information on loadings, reliability scores, and convergent validity scores can be found in Table 2.

Table 3 presents discriminant validity scores calculated using Fornell and Larcker's (1981) approach, and all scores support the distinctness of our measurement variables. Moreover, the heterotrait-monotrait ratio (HTMT) approach (Roemer et al., 2021) provided additional confirmation for discriminant validity (see Appendix Table 1).

4.1.2. Structural model

Different evaluative criteria, including the predictive power of the hypothesised model using Stone–Geisser's Q^2 coefficients and R^2 statistic, were employed to test the structural model parameters.

Both the Stone–Geisser Q^2 values of 0.658 for attitude and 0.497 for use intention, as reported in Table 4, substantially surpass the threshold of zero, signifying a strong predictive relevance of the hypothesised model. Furthermore, the hypothesised model explained 65.1 % of the variance in attitude towards CBDC and 49.25 % of the variance in CBDC use intentions.

Notably, PLS-SEM partially or fully supported eight of the eleven hypothesised relationships (Table 4). H7, H9, and H10 did not reach statistical significance. Time convenience, financial inclusion, and seamless transactions emerged as the strongest predictors of a positive attitude towards CBDC, followed by perceived financial cost. This suggests that individuals' considerations regarding CBDC use are primarily driven by affordance-based positive valences. All four identified positive valences significantly and positively related to attitude, indicating a greater salience of both individual and societal benefits than constraint-based negative valences such as perceived risk or social cognitions such as subjective norms in predicting attitudes towards CBDC use.

4.1.3. Robustness check

To ensure the robustness of our hypothesised model, we employed a comprehensive set of model fit metrics, drawing from recent research (Kock, 2022; Osakwe et al., 2020; Shibin et al., 2020). These metrics included the standardized root mean squared residual (SRMR), Simpson's paradox ratio (SPR), average block variance inflation factor (AVIF), R-squared contribution ratio (RSCR), statistical suppression ratio (SSR), and nonlinear bivariate causality direction ratio (NLBCDR).

As Table 5 shows, the SRMR value of 0.052 was well below the acceptable threshold of 0.1, indicating a good model fit (Kock, 2022). Additionally, the NLBCDR of 0.773 exceeded the acceptable threshold of 0.7, indicating that our structural model is less susceptible to reverse causality (Kock, 2022). Collectively, these findings support the

Table 2
Measurement variables' convergent validity and reliability test.

Measurement variables	Items	Loadings	Cronbach's alpha	Composite reliability (CR)	Average variance extracted (AVE)
Financial inclusion (FCN)	FCN1	0.933	0.956	0.958	0.884
$\bar{x} = 3.720$	FCN2	0.940			
SD = 0.797	FCN3	0.948			
Perceived superiority (PST)	PST1	0.913	0.936	0.940	0.838
$\bar{x} = 3.700$	PST2	0.920			
SD = 0.886	PST3	0.914			
Time convenience (TMC)	TMC1	0.950	0.962	0.963	0.897
$\bar{x} = 3.840$	TMC2	0.952			
SD = 0.847	TMC3	0.940			
Seamless transactions (SMT)	SMT1	0.894	0.924	0.924	0.801
$\bar{x} = 3.840$	SMT2	0.889			
SD = 0.711	SMT3	0.903			
Cognitive effort (CET)	CET1	0.983	0.965	0.983	0.967
$\bar{x} = 2.350$	CET2	0.983			
SD = 0.951	CET3[a]				
Perceived financial cost (PFC)	PFC1	0.884	0.950	0.953	0.834
$\bar{x} = 2.510$	PFC2	0.922			
SD = 0.715	PFC3	0.923			
	PFC4	0.923			
Perceived risk (PSK)	PSK1	0.903	0.948	0.949	0.824
$\bar{x} = 2.710$	PSK2	0.926			
SD = 0.973	PSK3	0.927			
	PRK4	0.873			
Lifestyle compatibility (LCT)	LCT1	0.925	0.957	0.958	0.884
$\bar{x} = 3.820$	LCT2	0.952			
SD = 0.789	LCT3	0.944			
Subjective norms (SNM)	SNM1	0.908	0.891	0.897	0.813
$\bar{x} = 2.800$	SNM2	0.895			
SD = 1.020	SNM3[a]				
Trust in central bank (TCB)	TCB1	0.961	0.983	0.984	0.937
$\bar{x} = 3.640$	TCB2	0.977			
SD = 0.948	TCB3	0.976			
	TCB4	0.959			
Attitude (ATT)	ATT1	0.954	0.969	0.971	0.919
$\bar{x} = 3.730$	ATT2	0.966			
SD = 0.805	ATT3	0.955			
Use intention (USE)	USE1	0.933	0.954	0.955	0.875
$\bar{x} = 3.910$	USE2	0.941			
SD = 0.814	USE3	0.933			

Note: $\bar{x}$ and SD represent mean and standard deviation of measurement variables.
[a] CET3 and SNM3 dropped due to low statistical loadings.

Table 3
Correlation matrix and discriminant validity.

Items	FCN	PSK	TMC	LCT	CET	USE	ATT	SNM	PFC	SMT	PST	TCB
FCN	**0.940**											
PSK	−0.085	**0.908**										
TMC	0.527	−0.093	**0.947**									
LCT	0.574	−0.023	0.735	**0.940**								
CET	−0.041	0.207	−0.090	−0.032	**0.983**							
USE	0.550	−0.032	0.723	0.698	−0.119	**0.936**						
ATT	0.645	−0.100	0.674	0.639	0.003	0.692	**0.958**					
SNM	0.234	0.078	0.122	0.100	0.163	0.164	0.183	**0.901**				
COST	0.028	0.343	−0.116	−0.068	0.234	−0.084	−0.082	0.130	**0.913**			
SMT	0.618	−0.020	0.569	0.666	−0.049	0.636	0.645	0.170	−0.031	**0.895**		
PST	0.547	0.060	0.458	0.405	0.012	0.565	0.506	0.236	0.106	0.405	**0.916**	
TCB	0.433	−0.127	0.378	0.370	−0.088	0.401	0.449	0.082	−0.044	0.403	0.406	**0.968**

Note: Square roots of average variances extracted (AVEs) shown on diagonal and in bold figures.
Note: FCN = financial inclusion; PSK = perceived risk; TMC = time convenience; LCT = lifestyle compatibility; CET = cognitive effort; USE = use intention; ATT = attitude; SNM = subjective norms; COST = perceived financial cost; SMT = seamless transactions; PST = perceived superiority; TCB = trust in central bank.

Table 4
Results of PLS-SEM hypotheses testing.

Hypothesised paths	Standardized estimate	f^2	R^2	Q^2	Remark
H1: Financial inclusion → Attitude	0.201 ($p <$ 0.001)	0.131	0.651	0.658	S
H2: Seamless transactions → Attitude	0.192 ($p <$ 0.001)	0.131			S
H3: Perceived superiority → Attitude	0.125 ($p =$ 0.013)	0.065			S
H4: Time convenience → Attitude	0.331 ($p <$ 0.001)	0.232			S
H5: Cognitive effort → Attitude	−0.077 ($p =$ 0.086)	0.009			MS
H6: Perceived financial cost → Attitude	−0.146 ($p =$ 0.004)	0.031			S
H7: Perceived risk → Attitude	0.013 ($p =$ 0.411)	0.003			NS
H8: Lifestyle compatibility → Attitude	0.083 ($p =$ 0.069)	0.055			MS
H9: Trust in central bank → Attitude	0.052 ($p =$ 0.179)	0.024			NS
H10: Subjective norms → Attitude	−0.029 ($p =$ 0.304)	0.006			NS
H11: Attitude → Use intention	0.701 ($p <$ 0.001)	0.492	0.492	0.497	S

Note: S = statistically significant; MS = moderately statistically significant; NS = statistically insignificant.
Note: f^2 = effect size; R^2 = coefficient of determination; Q^2 = Stone-Geisser's Q-squared coefficient.
Note: One-tailed tests were employed in accordance with the one-directional hypotheses, yielding the reported p values.

robustness and validity of our structural model.

4.2. Results from fsQCA

Following the initial model estimation, and as mentioned previously, this study extended its analysis by conducting fsQCA to examine the specific configurations of antecedent conditions that would yield use intention. In particular, it is crucial to recognise that use intention is a multifaceted outcome influenced by numerous factors. No singular factor possesses the ability to entirely dictate use intention. To address this complexity, we utilised asymmetric fsQCA to explore the nuanced configurations of conditions necessary and sufficient for high CBDC use intention. First, we performed contrarian case analysis and data calibration. Then, we examined the necessary and sufficient conditions for high use intentions. Details of these analyses are provided below.

Table 5
Test for the robustness of the hypothesised model using different quality criteria.

Index	Research reported value	Benchmark
Statistical suppression ratio (SSR)	SSR = 1.000	acceptable if ≥0.7
Sympson's paradox ratio (SPR)	SPR = 0.857	acceptable if ≥0.7, ideally = 1
Standardized root mean squared residual (SRMR)	SRMR = 0.052	acceptable if ≤0.1
Standardized mean absolute residual (SMAR)	SMAR = 0.041	acceptable if ≤0.1
Average block variance inflation factors (AVIF)	AVIF = 1.897	acceptable if ≤5, ideally ≤3.3
Average path coefficient (APC)	APC = 0.177 ($p < 0.001$)	
Average R-squared (ARS)	ARS = 0.571($p < 0.001$)	
R-squared contribution ratio (RSCR)	RSCR = 0.985	acceptable if ≥0.9, ideally = 1
Nonlinear bivariate causality direction ratio (NLBCDR)	NLBCDR = 0.773	acceptable if ≥0.7
Tenenhaus GoF	GoF = 0.706	small ≥ 0.1, medium ≥ 0.25, large ≥ 0.36

4.2.1. Contrarian case analysis and data calibration

First, a contrarian case analysis was conducted to investigate the existence of contrarian cases within the group of antecedent conditions of the intention to use CBDC. Following Woodside (2014), the variables were transformed into quintiles. The outcomes of the contingency table analysis conducted using SPSS software are presented in Appendix Table 2. The next step in our analysis was data calibration, which transformed raw data by assigning membership scores ranging from 0.0 to 1.0 (Ragin, 2009), where a score of 0.0 signified complete non-membership in the set, a score of 0.5 marked the crossover point, and a score of 1.0 indicated full-set membership (Rihoux, 2006). Accordingly, as the study utilised a five-point Likert scale, the calibration anchor for full membership was set at a value of 5, full non-membership at 1, and the crossover point at 3.

4.2.2. Results of the analysis of the necessary conditions

After successfully calibrating the data into fuzzy sets, the subsequent step involved a necessary condition analysis (NCA). Focusing on use intention as the outcome condition, this analysis aimed to ascertain whether any of the antecedent conditions were necessary for the presence or absence of use intention. A consistency range was measured between 0 and 1 (Rihoux, 2006), and a condition was deemed "necessary" when its consistency exceeded 0.9 (Ragin, 2009).

Table 6 illustrates that the affordance-based positive valences of financial inclusion, seamless transactions, and perceived superiority, along with the social and personal cognition factors of trust in the

Table 6
Necessary conditions.

Conditions	High use intention	
	Consistency	Coverage
Financial Inclusion	*0.925389*	0.964165
Seamless Transactions	*0.955034*	0.959513
Perceived Superiority	*0.910267*	0.963592
Time Convenience	0.887324	0.957545
Perceived Financial Cost	0.561425	0.958319
Cognitive Effort	0.467183	0.94086
Perceived Risk	0.596776	0.938037
Subjective Norms	0.640467	0.964779
Lifestyle Compatibility	*0.950804*	0.967952
Trust in Central Bank	*0.949807*	0.968471
Attitude	*0.937319*	0.971788

Necessary conditions are italicized.

central bank and lifestyle compatibility, as well as a positive attitude towards CBDCs, are all identified as necessary conditions for use intention. Time convenience stands out as the only positive valence condition not considered necessary for high use intention; however, with a consistency >0.8, it is regarded as "almost always necessary" (Ragin, 2000). Interestingly, none of the constraint-based negative valence conditions emerged as necessary for high use intention.

4.2.3. Results of the analysis of sufficient conditions

The analysis of sufficient conditions began with constructing a truth table following Ragin's (2009) methodology. A truth table consisting of 2^k rows (where k represents the number of conditions, and each row corresponds to a potential combination) was generated using a fuzzy-set algorithm. Subsequently, the truth table was refined by eliminating rows with a frequency <3, considering that the study's sample exceeded 150 (Fiss, 2011), and the consistency threshold was set at 0.9. The resultant fsQCA outcomes present three solutions: complex, parsimonious, and intermediate. In this study, the intermediate solution is selected as it is preferred in terms of its interpretability and completeness (Ragin, 2009). The specific results can be found in Table 7.

The findings presented in Table 7 reveal a "do not care" scenario for perceived superiority in C5, creating a discrepancy with the outcomes of the necessary condition analysis as depicted in Table 6. Adopting the perspective of Mattke et al. (2021), perceived superiority was not considered a necessary condition for high use intention. A similar argument applies to lifestyle compatibility in C6.

Table 7 presents six configurations associated with high CBDC use intention. The total solution coverage stood at 0.757, while the overall solution consistency reached an impressive 0.995, signifying that approximately 76 % of the outcome was covered by the six solutions. Configurations one to four (C1–C4) established financial inclusion, seamless transactions, perceived superiority, time convenience, lifestyle compatibility, trust in the central bank, and attitude as foundational elements generating high use intention. Within C1, the absence of perceived financial cost was introduced as perceived risk, cognitive efforts, and subjective norms prove inconsequential. In C2, cognitive effort was excluded, given the inconsequential role of perceived financial cost, perceived risk, and subjective norms. C3 introduced the presence of perceived risk to the baseline as perceived financial cost, cognitive effort, and subjective norms proved inconsequential. In C4, the inclusion of subjective norms complements the baseline, with perceived financial cost, cognitive effort, and perceived risk proving inconsequential. Configurations five to six (C5–C6) established financial inclusion, seamless transactions, time convenience, trust in the central bank, and attitude as the fundamental components for solutions yielding high use intention. In C5, the exclusion of perceived financial cost, cognitive effort, perceived risk, and subjective norms was introduced as perceived superiority proved inconsequential. Finally, C6 incorporated perceived superiority alongside perceived financial cost, perceived risk, and subjective norms as lifestyle compatibility proved inconsequential.

Table 7
Sufficiency analysis.

Conditions/configurations	High Use Intention					
	C1	C2	C3	C4	C5	C6
Financial Inclusion	●	●	●	●	●	●
Seamless Transactions	●	●	●	●	●	●
Perceived Superiority	●	●	●	●		●
Time Convenience	●	●	●	●	●	●
Perceived Financial Cost	⊗				⊗	●
Cognitive Effort		⊗			⊗	⊗
Perceived Risk			●		⊗	●
Subjective Norms				●	⊗	●
Lifestyle Compatibility	●	●	●	●	●	
Trust in Central Bank	●	●	●	●	●	●
Attitude	●	●	●	●	●	●
Raw coverage	0.531	0.576	0.497	0.556	0.295	0.285
Unique coverage	0.018	0.033	0.015	0.027	0.012	0.003
Consistency	0.998	0.999	0.997	1	0.992	0.997
Solution coverage	0.757					
Solution consistency	0.995					

Note: ● indicates the presence of a condition, ⊗ indicates its absence, and blank indicates "do not care".

4.2.4. Predictive validity

Furthermore, the predictive validity of the outcome configuration was assessed as recommended by Woodside (2014). Thus, in line with previous studies (e.g., Olya and Al-Ansi, 2018), the original dataset was divided into two subsamples. As Table 8 illustrates, the causal configurations influencing use intention in Subsample 1 were examined using an XY plot of data from Subsample 2. The configurations, coverage, and consistency observed in subsample 2 closely mirrored those from the original sample, particularly C2 and C4. This confirmed the predictive validity of the proposed model, affirming the study's robustness (Skaaning, 2011).

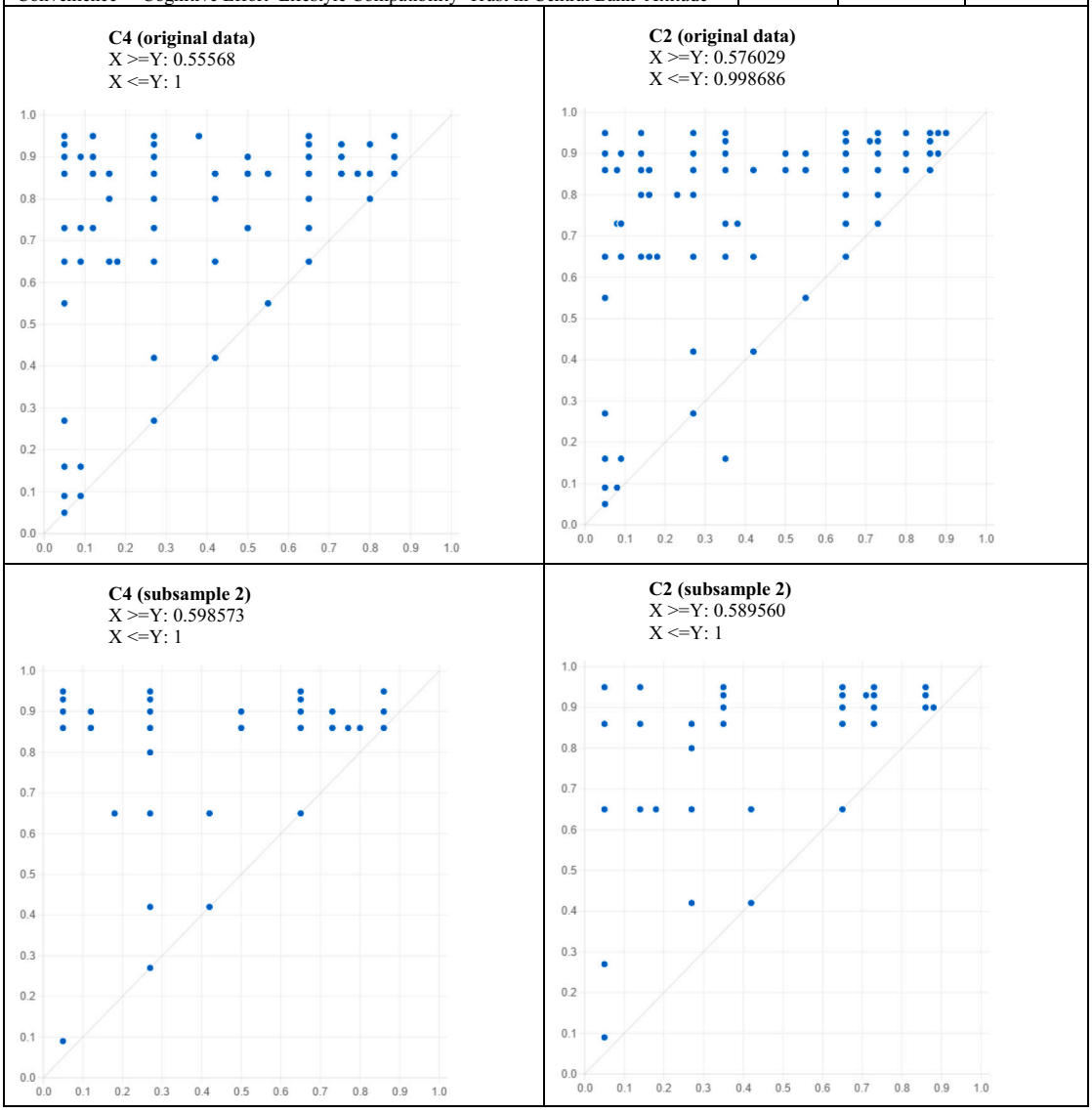
4.2.5. Evaluation of complexity theory

The preceding findings were assessed following Woodside's (2014) five tenets of complexity theory. The first tenet posits that a condition may be necessary but is rarely sufficient for yielding a high or low outcome condition. Supporting this tenet, the study's NCA and sufficiency analysis revealed that the necessary conditions were solely insufficient for predicting high use intention. The second tenet states that a complex condition of two or more conditions is sufficient for a consistently high score in an outcome condition. Table 7 illustrates instances supporting this, where a complex combination of antecedents was sufficient for consistently high scores in the outcome condition, as observed in C6. The third tenet asserts that a sufficient model is unnecessary for an outcome with a high score. Table 7 demonstrates support for this principle, indicating that the six alternative models for high use intention were sufficient but not necessary. The fourth tenet states that a condition in a recipe can contribute positively or negatively to a specific outcome depending on the presence or absence of the other ingredients in the recipe. For instance, perceived financial cost, perceived risk, and subjective norms played both positive and negative roles (C4, C5, and C6) in predicting use intention as depicted in Table 7, thus supporting Tenet 4.

Lastly, the fifth tenet posits that for high Y scores, a given recipe is relevant for some but not all cases (i.e., coverage is <1.00 for any one recipe). The findings presented in Table 7 demonstrate that the coverage of each solution was below 1, providing support for Tenet 5. In conclusion, the five tenets of complexity theory, as discussed, found support in the study's analysis, affirming the complex relationship among various factors related to CBDC use intentions.

Table 8
Predictive validity.

Model for high use intention	Raw coverage	Unique coverage	Consistency
Use intention= *f* (Financial Inclusion, Seamless Transactions, Time Convenience, Trust in Central Bank, Attitude, Perceived Financial Cost, Cognitive Effort, Perceived Risk, Subjective Norms, Perceived Superiority, Lifestyle Compatibility)			
C4: Financial Inclusion*Seamless Transactions*Perceived Superiority*Time Convenience *Lifestyle Compatibility*Trust in Central Bank*Attitude*Subjective Norms	0.556	0.027	1
C2: Financial Inclusion*Seamless Transactions*Perceived Superiority*Time Convenience*~ Cognitive Effort*Lifestyle Compatibility*Trust in Central Bank*Attitude	0.576	0.033	0.999



5. Discussion, implications, and recommendations for future research

5.1. Discussion

Results from the PLS-SEM analysis revealed that all the positive valence factors explored are significantly associated with individual attitudes towards CBDC. These findings corroborate numerous studies (e.g., Ryu, 2018; Xu et al., 2017; Kleijnen et al., 2007) that have demonstrated the role of seamless transactions, perceived superiority, and time convenience in shaping user attitudes and intentions, particularly regarding the adoption of emerging technologies.

Although the finding that the societal benefit of financial inclusion positively correlates with attitudes towards CBDC constitutes a novel contribution to CBDC research, it is consistent with the findings of Teutio et al. (2023), who found that mobile money usage exhibited a positive correlation with financial inclusion. Our study also indicates that a favourable attitude towards CBDC usage is strongly associated with its potential to enhance financial inclusion, which resonates with the findings of Wang et al. (2023), who established that consumer perceptions of the societal benefits of CBDCs in China can stimulate their willingness to utilise CBDCs.

While perceived financial cost significantly influences attitudes towards CBDC (see Ogunmola and Das, 2024 for similar findings), the cognitive effort is only marginally significant, while the perceived risk is nonsignificant. However, other studies (Gupta et al., 2023; Kim et al.,

2023) indicate that perceived risk in CBDC significantly deters user adoption. This study's nonsignificant claim could stem from the missed reaction that trails the underlying technology of CBDCs: blockchain. Meanwhile, the lack of support for a negative relationship between perceived risk and attitudes in the present study aligns with the findings of Ma et al.'s (2022) study conducted in the Chinese context, which similarly observed that perceived risk alone might not be a sufficient deterrent for individuals' adoption of CBDC.

In our analysis of social cognitive factors, we found that lifestyle compatibility exhibits marginal significance, while trust in the central bank and subjective norms do not yield significant effects. Notably, existing studies (Laksamana et al., 2023; Ma et al., 2022; Osakwe et al., 2022a; Söilen and Benhayoun, 2022) consistently emphasised the importance of trust and subjective norms as predictors of individuals' attitudes and fintech adoption. However, a marked distinction lies in our study's specific focus on trust levels in the regulator, specifically the central bank. This specificity may account for the variance between our findings and those of prior research. Meanwhile, our nonsignificant results align with a related study by Giménez and Tamajón (2019), which also failed to support the positive impact of both trust and subjective norms on attitudes towards digital currency use. Interestingly, our study diverges from a CBDC investigation in India, which found that perceived trust significantly diminishes attitudes towards the digital Rupee (Ogunmola and Das, 2024).

From the asymmetrical analysis, it is evident that all positive valence factors (except for perceived superiority) were present in the six reported configurations. This finding corroborates the significant relationships of these factors observed in the SEM analysis. Further, the absence of perceived superiority in C5 could be explained by the necessary absence of negative valence, which then makes it perceived as superior compared to traditional alternatives fraught with these negative valences. More specifically, the first four configurations (i.e., C1–C4 in Table 7) signify that affordance-based positive valence, complemented by trust in the central bank, lifestyle compatibility, and positive attitudes towards CBDC, are crucial for CBDC use intentions. In essence, the early adoption of CBDC hinges on the complementarity of positive valences, trust in the central bank, lifestyle compatibility, and a favourable attitude towards CBDC. While these findings represent a novel contribution within the CBDC adoption context, they also support the broader claims in fintech research, specifically, the significance of perceived benefits (analogous to positive valences in our study), trust, compatibility, and overall attitude in shaping the adoption and use of fintech (e.g., Joshi and Chawla, 2023; Pal et al., 2021; Ryu, 2018; Söilen and Benhayoun, 2022).

As C5 (Table 7) reveals, central to CBDC adoption is trust in the central bank and compatibility with individuals' lifestyles, both complemented by positive perceptions of the technology's benefits and limited downsides (i.e., mitigated valences). Moreover, C6 (Table 7) presents the most intricate scenario for CBDC adoption. High positive perceptions of benefits (i.e., affordance-based positive valences), subjective norms, and positive attitudes can still drive high use intentions, even in the face of potential drawbacks like perceived cost and risk and regardless of lifestyle compatibility. However, this requires a lower perception of cognitive effort associated with using CBDC.

Collectively, these findings provide deeper insights into the decision-making process for CBDC adoption, extending beyond the initial SEM-based results. Thus, they complement and expand upon previous CBDC adoption studies (such as Gupta et al., 2023; Kim et al., 2023; Ogunmola and Das, 2024; Wang et al., 2023).

5.2. Implications for theory

This study has significant implications for theory development in the field of CBDC research and, more broadly, fintech literature. Drawing upon the PLS-SEM findings, this study demonstrates that affordance-based positive valences (such as time convenience and seamless transactions) outweigh constraint-based negative valences and socio-environmental and personal cognition factors in predicting positive attitudes towards CBDC. Therefore, maximising these positive valences becomes crucial for fostering favourable attitudes towards CBDCs.

To the best of our knowledge, this study is the first of its kind within the CBDC context. Thus, it should motivate future research to explore additional positive valences associated with CBDC use, extending beyond the scope of our study. Furthermore, our research aligns with the empirical support found in Yoo et al.'s (2020) research on Bitcoin and Jain and Raman's (2022) study on digital finance, where similar results were observed in their respective research contexts.

Additionally, this study highlights that the societal benefit of financial inclusion plays a pivotal role in shaping individuals' favourable attitudes towards CBDC. This resonates with Wang et al.'s (2023) findings, which emphasised the social advantages linked to CBDC, including its potential for promoting anti-fraud measures, a cashless society, and improved monetary policy performance. Moreover, our findings align with the fintech literature of African countries (such as Ekong and Ekong, 2022; Ozili, 2018, 2023a, 2023b), which has arguments that individuals in underserved markets, such as Nigeria, may exhibit greater receptivity to fintech innovations, including CBDC.

Furthermore, to the best of our knowledge, this research represents the first exploration within the CBDC domain to identify the core prerequisites for early CBDC adoption, particularly at the individual-consumer level and in a CBDC pioneer nation such as Nigeria. Our necessary condition analysis reveals five main prerequisite factors for high CBDC use intentions, including consumer perceptions of CBDC's societal benefits (measured by financial inclusion), seamless transactions, lifestyle compatibility, trust in the central bank, and a positive attitude towards CBDC. Future research can build upon these findings to develop deeper insights into the prerequisites for facilitating CBDC adoption, thereby enriching scholarly understanding of this important topic. Overall, our study illuminates the necessary conditions for CBDC uptake and, by extension, government-enabled financial tools.

Additionally, this research contributes significantly to the existing knowledge based on its sufficiency analysis related to CBDC adoption. Notably, it represents one of the earliest scientific endeavours to reveal the multiple pathways leading to high use intentions of CBDC, which serves as a proxy for early CBDC adoption. Specifically, we identified six distinct paths that converge towards the same outcome: (high) use intentions for CBDC. Previously, research in this domain primarily focused on exploring individual antecedent factors influencing CBDC use intention (see Gupta et al., 2023; Kim et al., 2023; Ogunmola and Das, 2024; Söilen and Benhayoun, 2022; Wang et al., 2023); however, this narrow approach has limited both empirical investigations and scholarly progress. In contrast, the present study light on how positive and negative valences, along with social and personal cognitions, collectively shape CBDC adoption. Moreover, it responds to recent calls within technology-based research by integrating SEM with complementary methods such as fsQCA (Loh et al., 2023; McLeay et al., 2022; Yee et al., 2021).

This methodological contribution not only sets a precedent for investigating complex phenomena like adoption intentions in the emerging CBDC domain but also provides a roadmap for future studies seeking to understand CBDC adoption decisions.

Finally, combining valence theory (Peter and Tarpey Sr, 1975), SCT (Bandura, 1989), and TRA (Ajzen and Fishbein, 1980), our analysis illuminates how individuals decide to adopt CBDCs. This integrative approach not only improves understanding of the topic but also strengthens the external validity, and ultimately the predictive power, of these theories.

5.3. Implications for policy and SDGs

This study provides actionable insights for both central bank authorities and their media partners. First, the PLS-SEM analysis revealed a

more dominant role for affordance-based positive valences like financial inclusion and time convenience in shaping CBDC user attitudes compared to (constraint-based) negative valences like cost and risk. This suggests that maximising perceived benefits through targeted interventions and awareness campaigns could be an effective strategy for promoting CBDC uptake. Policymakers could prioritise initiatives that highlight the societal benefits of financial inclusion associated with CBDC use, alongside its advantages in terms of seamless transactions, time convenience, and perceived superiority over existing payment methods.

Second, and relatedly, this study demonstrated that improving the initial adoption of CBDC hinges on four significant factors: the societal benefit of financial inclusion, seamless transactions, central bank trust, and positive individual attitudes. Therefore, policymakers must prioritise strategies in these areas to unlock the full potential of CBDCs for both individuals and society. One such strategy includes employing transparent communication campaigns to build trust and investing heavily in user-centric technology to improve transaction speed and transparency.

Third, the fsQCA analysis revealed six actionable configurations driving high CBDC use intentions, transcending prior single-factor approaches (Gupta et al., 2023; Kim et al., 2023; Söilen and Benhayoun, 2022). This unveils the intricate interplay of adoption conditions, offering valuable insights for central bank management to tailor strategies for promoting widespread CBDC use. Notably, the analysis underscores the absence of a singular "best" solution; instead, suggesting that multiple pathways can lead to high CBDC adoption (as proxied by use intentions). This implies that central banks can choose from a variety of effective strategies (see Table 7) to facilitate CBDC uptake. Consider solution four (C4, Table 7) as one example among the six solutions. Here, the central bank could prioritise campaigns and educational content focused on the four identified affordance-based positive valences alongside the factors of subjective norms, trust in the regulator, and individual attitude. This holistic approach can effectively stimulate individuals' use of CBDC.

Finally, beyond the practical implications of our study for central bank authorities and their media partners, the study's findings – particularly, the role of the societal positive valence of financial inclusion as an important factor for CBDC adoption (measured by use intentions here) – contribute to the current debate (e.g., Better Than Cash Alliance, 2023; Michael et al., 2022; Ozili, 2023b) on the nexus between fintech and the realisation of some of the laudable United Nations Sustainable Development Goals (SDGs), especially SDG 9 (industry, innovation and infrastructure) and SDG 10 (reduced socioeconomic inequalities). The research participants also highlighted a broader social motivation for using CBDCs, as they believe it can benefit the community, particularly by promoting financial inclusion, which contributes to sustainable and inclusive development. Interestingly, their willingness to use CBDCs in light of our findings also suggests it could promote sustainable consumption and production (SDG 12). This is partly due to the potential cost reduction in printing paper currency if CBDCs are widely adopted.

5.4. Limitations and recommendations for future studies

We must acknowledge the limitations of the present study. In particular, despite employing a multi-theoretical and multi-method approach, we recognise the possibility of overlooking relevant factors influencing individuals' CBDC attitudes and intentions. Therefore, we encourage future researchers to explore alternative theoretical frameworks to expand our understanding of this topic. Cross-country studies on CBDC adoption can further broaden the research base and provide valuable insights into the interplay of adoption factors across diverse contexts. This is important as previous studies highlight the role of national culture in CBDC adoption (Luu et al., 2023). By applying Hofstede's national culture dimensions in this study's context, we found that the public may readily adopt CBDCs if they are endorsed by respected authorities, promoted through community-based initiatives, positioned as competitive and experimental, and capable of offering immediate rewards. We also acknowledge that this may significantly differ in other study contexts due to varying cultural influences. For instance, the applicability of our tested model to other CBDC pioneers, such as the Bahamas and Jamaica, warrants further exploration. In this regard, scholars could explore the role of cultural values, particularly at the individual level, in shaping CBDC adoption decisions. We believe that such an exploration would further enrich scholarly and policymakers' understanding of the CBDC adoption decision-making process.

Moreover, given the nascent stage of CBDC development globally, qualitative research offers unique insights that quantitative methods alone may not fully uncover. While the present study, as well as previous ones (Kim et al., 2023; Ogunmola and Das, 2024; Wang et al., 2023), have made significant contributions, qualitative approaches can provide a deeper understanding of contextual nuances. Academics are, therefore, encouraged to explore CBDC adoption decision-making qualitatively, especially in countries currently contemplating CBDC introduction or where it has already been rolled out, such as the Bahamas and Nigeria.

Author statement

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CRediT authorship contribution statement

Christian Nedu Osakwe: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Oluwatobi A. Ogunmokun:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Methodology, Investigation, Formal analysis, Data curation. **Islam Elgammal:** Writing – review & editing, Writing – original draft, Visualization, Validation, Resources. **Michael Adu Kwarteng:** Writing – review & editing, Writing – original draft, Visualization, Resources.

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Appendix A

Appendix Table 1
Discriminant validity test based on HTMT ratios (good if <0.90, best if <0.85).

Variables	PSK	TMC	LCT	CET	USE	PST	TCB	SNM	ATT	PFC	SMT	FCN
PSK												
TMC	0.173											
LCT	0.142	0.782										
CET	0.238	0.117	0.087									
USE	0.095	0.764	0.734	0.161								
PST	0.070	0.447	0.397	0.042	0.523							
TCB	0.199	0.448	0.428	0.109	0.467	0.412						
SNM	0.059	0.156	0.130	0.167	0.185	0.212	0.111					
ATT	0.197	0.698	0.664	0.048	0.716	0.497	0.508	0.203				
PFC	0.348	0.178	0.148	0.276	0.113	0.072	0.109	0.090	0.116			
SMT	0.119	0.628	0.706	0.077	0.686	0.397	0.469	0.202	0.672	0.115		
FCN	0.161	0.613	0.638	0.100	0.624	0.526	0.506	0.252	0.683	0.062	0.708	

Appendix Table 2
Contrarian cases.

			Use intention				Total				Use intention				Total
			1	3	4	5					1	3	4	5	
Perceived risk phi = 0.318 $p < 0.000$	1	Count	13	19	**14**	**15**	61	Trust in central bank Phi = 0.836 $p \leq 0.000$	1	Count	47	12	**1**	**3**	63
		% within % of Total	21.3 %	31.1 %	**23.0 %** **4.5 %**	**24.6 %** **4.8 %**	100.0 % 19.7 %			% within % of Total	74.6 % 15.2 %	19.0 % 3.9 %	**1.6 %** **0.3 %**	**4.8 %** **1.0 %**	100.0 % 20.3 %
	2	Count	8	34	**7**	**14**	63		2	Count	2	6	**1**	**0**	9
		% within % of Total	12.7 % 2.6 %	54.0 % 11.0 %	**11.1 %** **2.3 %**	**22.2 %** **4.5 %**	100.0 % 20.3 %			% within % of Total	22.2 % 0.6 %	66.7 % 1.9 %	**11.1 %** **0.3 %**	**0.0 %** **0.0 %**	100.0 % 2.9 %
	3	Count	3	14	3	3	23		3	Count	9	114	16	19	158
		% within % of Total	13.0 % 1.0 %	60.9 % 4.5 %	13.0 % 1.0 %	13.0 % 1.0 %	100.0 % 7.4 %			% within % of Total	5.7 % 2.9 %	72.2 % 36.8 %	10.1 % 5.2 %	12.0 % 6.1 %	100.0 % 51.0 %
	4	Count	**18**	**62**	8	11	99		4	Count	**3**	**7**	11	6	27
		% within % of Total	**18.2 %** **5.8 %**	**62.6 %** **20.0 %**	8.1 % 2.6 %	11.1 % 3.5 %	100.0 % 31.9 %			% within % of Total	**11.1 %** **1.0 %**	**25.9 %** **2.3 %**	40.7 % 3.5 %	22.2 % 1.9 %	100.0 % 8.7 %
	5	Count	**22**	**24**	7	11	64		5	Count	**3**	**14**	10	26	53
		% within % of Total	**34.4 %** **7.1 %**	**37.5 %** **7.7 %**	10.9 % 2.3 %	17.2 % 3.5 %	100.0 % 20.6 %			% within % of Total	**5.7 %** **1.0 %**	**26.4 %** **4.5 %**	18.9 % 3.2 %	49.1 % 8.4 %	100.0 % 17.1 %
Lifestyle compatibility phi = 0.876 $p < 0.000$	1	Count	49	10	**1**	**1**	61	Cognitive effort phi = 0.291 $p < 0.01$	1	Count	12	19	**11**	**17**	59
		% within % of Total	80.3 % 15.8 %	16.4 % 3.2 %	**1.6 %** **0.3 %**	**1.6 %** **0.3 %**	100.0 % 19.7 %			% within % of Total	20.3 % 3.9 %	32.2 % 6.1 %	**18.6 %** **3.5 %**	**28.8 %** **5.5 %**	100.0 % 19.0 %
	2	Count	2	5	**1**	**1**	9		3	Count	26	69	**16**	**23**	134
		% within % of Total	22.2 % 0.6 %	55.6 % 1.6 %	**11.1 %** **0.3 %**	**11.1 %** **0.3 %**	100.0 % 2.9 %			% within % of Total	19.4 % 8.4 %	51.5 % 22.3 %	**11.9 %** **5.2 %**	**17.2 %** **7.4 %**	100.0 % 43.2 %
	3	Count	**7**	**126**	17	23	173		4	Count	**10**	**45**	10	12	77
		% within % of Total	**4.0 %** **2.3 %**	**72.8 %** **40.6 %**	9.8 % 5.5 %	13.3 % 7.4 %	100.0 % 55.8 %			% within % of Total	**13.0 %** **3.2 %**	**58.4 %** **14.5 %**	13.0 % 3.2 %	15.6 % 3.9 %	100.0 % 24.8 %
	5	Count	**6**	**12**	20	29	67		5	Count	**16**	**20**	2	2	40
		% within % of Total	**9.0 %** **1.9 %**	**17.9 %** **3.9 %**	29.9 % 6.5 %	43.3 % 9.4 %	100.0 % 21.6 %			% within % of Total	**40.0 %** **5.2 %**	**50.0 %** **6.5 %**	5.0 % 0.6 %	5.0 % 0.6 %	100.0 % 12.9 %
Perceived superiority phi = 0.548 $p <$ 0.000	1	Count	43	35	**5**	**5**	88	Time convenience phi = 0.546 $p <$ 0.000	1	Count	20	6	**5**	**6**	37
		% within	48.9 %	39.8 %	**5.7 %**	**5.7 %**	100.0 %			% within	54.1 %	16.2 %	**13.5 %**	**16.2 %**	100.0 %

(*continued on next page*)

Appendix Table 2 (*continued*)

			Use intention				Total
			1	3	4	5	
		% of Total	13.9 %	11.3 %	**1.6 %**	**1.6 %**	28.4 %
	2	Count	6	13	**4**	**8**	31
		% within	19.4 %	41.9 %	**12.9 %**	**25.8 %**	100.0 %
		% of Total	1.9 %	4.2 %	**1.3 %**	**2.6 %**	10.0 %
	3	Count	**12**	**81**	12	19	124
		% within	**9.7 %**	**65.3 %**	9.7 %	15.3 %	100.0 %
		% of Total	**3.9 %**	**26.1 %**	3.9 %	6.1 %	40.0 %
	5	Count	**3**	**24**	18	22	67
		% within	**4.5 %**	**35.8 %**	26.9 %	32.8 %	100.0 %
		% of Total	**1.0 %**	**7.7 %**	5.8 %	7.1 %	21.6 %
Subjective norm phi = 0.227 $p > 0.1$	1	Count	15	10	**4**	**9**	38
		% within	39.5 %	26.3 %	**10.5 %**	**23.7 %**	100.0 %
		% of Total	4.8 %	3.2 %	**1.3 %**	**2.9 %**	12.3 %
	2	Count	18	45	**13**	**17**	93
		% within	19.4 %	48.4 %	**14.0 %**	**18.3 %**	100.0 %
		% of Total	5.8 %	14.5 %	**4.2 %**	**5.5 %**	30.0 %
	3	Count	**16**	**48**	10	17	91
		% within	**17.6 %**	**52.7 %**	11.0 %	18.7 %	100.0 %
		% of Total	**5.2 %**	**15.5 %**	3.2 %	5.5 %	29.4 %
	4	Count	**2**	**7**	1	1	11
		% within	**18.2 %**	**63.6 %**	9.1 %	9.1 %	100.0 %
		% of Total	**0.6 %**	**2.3 %**	0.3 %	0.3 %	3.5 %
	5	Count	**13**	**43**	11	10	77
		% within	**16.9 %**	**55.8 %**	14.3 %	13.0 %	100.0 %
		% of Total	**4.2 %**	**13.9 %**	3.5 %	3.2 %	24.8 %
Attitude phi = 0.727 $p < 0.000$	1	Count	47	23	**7**	**3**	80
		% within	58.8 %	28.8 %	**8.8 %**	**3.8 %**	100.0 %
		% of Total	15.2 %	7.4 %	**2.3 %**	**1.0 %**	25.8 %
	2	Count	2	8	**2**	**1**	13
		% within	15.4 %	61.5 %	**15.4 %**	**7.7 %**	100.0 %
		% of Total	0.6 %	2.6 %	**0.6 %**	**0.3 %**	4.2 %
	3	Count	**14**	**114**	13	27	168
		% within	**8.3 %**	**67.9 %**	7.7 %	16.1 %	100.0 %
		% of Total	**4.5 %**	**36.8 %**	4.2 %	8.7 %	54.2 %
	5	Count	**1**	**8**	17	23	49
		% within	**2.0 %**	**16.3 %**	34.7 %	46.9 %	100.0 %
		% of Total	**0.3 %**	**2.6 %**	5.5 %	7.4 %	15.8 %
Financial inclusion phi = 0.556 $p < 0.000$	1	Count	40	26	**3**	**7**	76
		% within	52.6 %	34.2 %	**3.9 %**	**9.2 %**	100.0 %
		% of Total	12.9 %	8.4 %	**1.0 %**	**2.3 %**	24.5 %
	2	Count	8	8	**3**	**5**	24
		% within	33.3 %	33.3 %	**12.5 %**	**20.8 %**	100.0 %
		% of Total	2.6 %	2.6 %	**1.0 %**	**1.6 %**	7.7 %
	3	**Count**	**14**	**105**	20	27	166
Perceived financial cost phi = 0.227 $p > 0.1$	1	Count	9	14	5	**10**	**38**
		% within	23.7 %	36.8 %	13.2 %	**26.3 %**	**100.0 %**
		% of Total	2.9 %	4.5 %	1.6 %	**3.2 %**	**12.3 %**
	2	Count	12	39	14	**16**	**81**
		% within	14.8 %	48.1 %	17.3 %	**19.8 %**	**100.0 %**
		% of Total	3.9 %	12.6 %	4.5 %	**5.2 %**	**26.1 %**
	3	Count	**5**	**17**	6	7	35
		% within	**14.3 %**	**48.6 %**	17.1 %	20.0 %	100.0 %
		% of Total	**1.6 %**	**5.5 %**	1.9 %	2.3 %	11.3 %
	4	Count	**29**	**71**	11	20	131
		% within	**22.1 %**	**54.2 %**	8.4 %	15.3 %	100.0 %
		% of Total	**9.4 %**	**22.9 %**	3.5 %	6.5 %	42.3 %
	5	Count	**9**	**12**	3	1	25
		% within	**36.0 %**	**48.0 %**	12.0 %	4.0 %	100.0 %
		% of Total	**2.9 %**	**3.9 %**	1.0 %	0.3 %	8.1 %
Seamless transactions phi = 0.663 $p < 0.000$	1	Count	38	17	**5**	**4**	64
		% within	59.4 %	26.6 %	**7.8 %**	**6.3 %**	100.0 %
		% of Total	12.3 %	5.5 %	**1.6 %**	**1.3 %**	20.6 %
	2	Count	5	4	**0**	**4**	13
		% within	38.5 %	30.8 %	**0.0 %**	**30.8 %**	100.0 %
		% of Total	1.6 %	1.3 %	**0.0 %**	**1.3 %**	4.2 %
	3	Count	**17**	**115**	11	29	172
		% within	**9.9 %**	**66.9 %**	6.4 %	16.9 %	100.0 %
		% of Total	**5.5 %**	**37.1 %**	3.5 %	9.4 %	55.5 %
	5	Count	**4**	**17**	23	17	61
		% within	**6.6 %**	**27.9 %**	37.7 %	27.9 %	100.0 %
		% of Total	**1.3 %**	**5.5 %**	7.4 %	5.5 %	19.7 %

Contrarian cases in bold

(*continued on next page*)

Appendix Table 2 (*continued*)

		Use intention				Total	Use intention				Total
		1	3	4	5		1	3	4	5	
	%	**8.4**	**63.3**	12.0	16.3	100.0					
	within	**%**	**%**	%	%	%					
	% of	**4.5**	**33.9**	6.5 %	8.7 %	53.5					
	Total	**%**	**%**			%					
5	**Count**	**2**	**14**	13	15	44					
	%	**4.5**	**31.8**	29.5	34.1	100.0					
	within	**%**	**%**	%	%	%					
	% of	**0.6**	**4.5**	4.2 %	4.8 %	14.2					
	Total	**%**	**%**			%					

Data availability

The data that has been used is confidential.

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