Performance Evaluation of Digital Rupee Adoption in Banks from the Perspective of Fit and Viability Model: A Pilot Study with Bankers

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Abstract

Reserve Bank of India (RBI) has recently launched country's first pilot project for digital currency, the digital rupee. Success of digital rupee adoption in banks depends on factors like task technology fit (TTF) and viability. TTF focuses on how well task requirements fit with the features of digital rupee applications. Viability includes economic feasibility, maturity of the IT infrastructure, and organization readiness of IS implementation. The purpose of this paper is to study the adoption of digital rupees in banks and use of the fit-viability model to evaluate the probable success or failure of digital rupee adoption from banker's perspective.

Keywords: Task Technology Fit; Economic Feasibility; IT Infrastructure; Organization Readiness; Fit-Viability Framework, Digital Rupee

1. Introduction

The global financial scenario is evolving rapidly, with Central Bank Digital Currencies (CBDCs) emerging as a significant technology-based innovation in monetary systems (Ozili, 2023). A "Digital Rupee" is a form of CBDC that represents the value of fiat currency in a purely digital format. Unlike traditional cash, digital currencies offer lower transaction costs and facilitate instantaneous payments by enabling direct peer-to-peer transfers (Kulkarni, 2022). As of Feb 2025, more than 130 countries, covering over 98% of the global economy, are actively developing or piloting digital currencies, with several in the advanced stages of implementation (Atlantic Council, 2025). In tune with this global trend, the Reserve Bank of India (RBI) launched its digital rupee pilot program in 2022, marking a critical milestone in India's transition towards a digital financial ecosystem. According to the Indian Banks' Association (IBA), at present, the pilot phase is continuing with 15 banks, namely SBI, ICICI Bank, Yes Bank, IDFC First Bank, Bank of Baroda, Union Bank of India, HDFC Bank, Kotak Mahindra Bank, PNB, Canara Bank, Axis

Bank, IndusInd Bank, Federal Bank, Karnataka Bank and Indian Bank.

Some of the benefits of the digital rupee are with blockchain technology; the digital rupee will increase efficiency and transparency, blockchain will also enable real-time tracking and ledger maintenance, the payment system will be available to wholesale and retail customers 24/7, Indian buyers can pay without a middle man, lower transaction cost, real-time account settlements, no need to open a bank account to transact with a digital rupee, fast cross-border transactions, no risk of volatility, as the RBI, will back it, digital rupee will be mobile forever compared to currency notes (Lodha & Harane, 2023). Bhatnagar et al. (2024) emphasize the potential benefits of early CBDC adoption for India's economic development as the digital rupee intends to increase financial inclusion for the unbanked and underbanked population, decrease the usage of cash in the economy, and encourage the use of electronic payments. Although there are many advantages to introducing the digital rupee, its success depends on a number of factors, such as public acceptance, financial institutions' readiness, and technological viability. But problems still exist, such as inequalities in technological literacy, cybersecurity issues, and gaps in digital infrastructure. Because of these complications, it is crucial to determine whether the digital rupee is compatible with the operational frameworks of banking institutions and the needs of end users. The timing of this study is important because early assessments can help determine whether the adoption of digital rupees is successful. The pilot phase's insights can guide the development of strategic adoption frameworks, technological advancements, and necessary regulatory changes. If adequately implemented, the digital rupee could improve monetary policy transmission, decrease reliance on cash, and increase financial inclusion. However, without a systematic evaluation of its viability, the project might run into obstacles to adoption, opposition from important stakeholders, and unforeseen inefficiencies.

The practical feasibility of CBDCs, especially in Indian banking institutions, has not received much empirical research despite in-depth discussions in international financial literature. Most current research concentrates on theoretical advantages like improved monetary policy implementation, financial inclusion, and transaction efficiency (Sinelnikova-Muryleva et al., 2020; Ozili, 2023). There is a visible research gap in determining whether these theoretical benefits result in real success when applied to banking operations. Secondly, prior studies on CBDCs focus on macroeconomic and policy viewpoints; however, institutional and operating factors that are important for banks' adoption have not been examined. Hence, our paper adds value to the literature.

CBDC adoption requires a supportive regulatory framework, economic feasibility, institutional readiness, and technological compatibility. Although some studies have explored consumer trust and regulatory aspects of CBDCs, none have systematically evaluated banks' readiness in terms of digital infrastructure, regulatory compliance, and economic sustainability. Hence, we use the Fit- Viability Model (FVM) to examine this aspect. FVM provides a structured approach to addressing these gaps by examining two critical dimensions:

Technology Fit – Assessing whether the digital rupee's technological infrastructure aligns with banks' functional requirements and transaction processes.
Organizational Viability – Evaluating banks' economic feasibility, social readiness, and IT infrastructure maturity to determine their capacity for successful CBDC adoption.

The results indicate that IT infrastructure, organizational readiness, and task-technology fit demonstrate a significant and positive impact on the performance of digital rupee adoption. However, economic feasibility does not exhibit a significant relationship with the performance of digital rupee adoption.

2. Theoretical Background

2.1. Task-Technology Fit Model

The pivotal aspect of a task-technology fit (TTF) framework is an established construct referred to as TTF, which aligns the attributes of the technology with the demands of the task; in other terms, it pertains to the capacity of information technology to effectively assist in the execution of a task (Goodhue & Thompson, 1995). Task-Technology Fit (TTF) signifies the alignment between the capabilities of a technology and the requirements stipulated by the tasks it is intended to support.

This notion is pivotal in comprehending the dynamics of technology adoption and the resultant performance metrics across a myriad of sectors. Contemporary research has broadened the scope of TTF theory to encompass the ramifications of both task-technology alignment and misalignment, underscoring the significance of this congruence in fostering user acceptance and operational efficacy.

TTF evaluates the extent to which technology fulfils task specifications, thereby affecting user performance and the utilization of technology (Spies et al., 2020). The expanded TTF (E-TTF) framework introduces the notions of "insufficient fit" and "excessive fit," wherein inadequate functionalities or overcomplicated interfaces may obstruct technology adoption.

TTF has been employed across a variety of domains, particularly in healthcare and education, showcasing its adaptability in assessing technological efficacy (Spies et al., 2020). In the context of Massive Open Online Courses (MOOCs), TTF was determined to have a substantial effect on students' intentions to engage with online tools, thereby illuminating the influence of task attributes on technology acceptance (Ulfa et al., 2024). TTF is equally pertinent in the realm of business analytics, where the alignment between analytical tools and business tasks can augment problem- solving competencies, suggesting that both insufficient fit and excessive fit may be deemed acceptable in specific scenarios (Muchenje et al., 2024).

Although TTF offers a comprehensive framework for elucidating technology efficacy, it is imperative to acknowledge that not all instances of misalignment culminate in adverse consequences. In certain contexts, a degree of misalignment may still produce satisfactory outcomes, indicating a necessity for further investigation into the intricacies of task-technology interactions.

2.2 Fit-Viability Model

The Fit-Viability Model (FVM) functions as a comprehensive framework designed to evaluate the congruence and sustainability of technological implementations across a multitude of sectors, such as healthcare, cloud computing, mobile technology, among others. This model scrutinizes two fundamental dimensions: "fit," which denotes the degree of compatibility between technological attributes and organizational requirements, and "viability," which assesses both the economic feasibility and the preparedness of the organization for technology adoption. The subsequent sections provide an in-depth exposition of the principal elements of the FVM.

The fit dimension quantifies the extent to which the technology fulfills task-related requirements. Examples: In the healthcare sector, e-health solutions are required to align seamlessly with the needs of patient care (Wickramasinghe et al., 2018). In the domain of cloud computing, a high degree of fit signifies successful integration with business processes (Tripathi & Nasina, 2017). The viability dimension assesses the economic and operational preparedness for the adoption of technology. Research indicates that organizations demonstrating high viability are more predisposed to successfully implement technological advancements, such as mobile applications and barcode systems (Liang et al., 2007; Zulham et al., 2025). The FVM is instrumental in identifying critical factors necessary for the sustainability of e-health solutions (Wickramasinghe et al., 2018). A comprehensive multi-case analysis revealed that firms exhibiting both high fit and viability experienced successful implementations of cloud technologies (Tripathi & Nasina, 2017). The model offers a set of guidelines for businesses to evaluate the adoption of mobile technologies (Liang et al., 2007).

Liang et al. (2021) examined factors that influence managerial intention to adopt blockchain technology. They extended the fit-viability model (FVM) and develop a value-based technology adoption model through an empirical study of 242 managers mostly in medical and financial industries. Managers in such organizations are likely to consider the fit and viability of adopting blockchain technology to store and protect data.

AlAjmi et al. (2021) developed a conceptual model to examine the factors laid down by the Information technology (IT) adoption theory that influence the E-Learning Based Cloud Computing (ELBCC) by integrating fit-viability theory with the diffusion of innovations (DOI) theory's factors. Furtherthe , this study conveyed an integrated model for investigating Cloud Computing adoption for E-Learning in HEIs in the Omani context in the Sultanate of Oman, and it provides the foundation for coming studies due to its infancy and deep insight into cloud computing development. The FVM is utilized to assess the application of blockchain technology for enhancing cybersecurity in smart vehicles, underscoring the significance of task-technology fit (Patil et al., 2024). While the FVM presents a robust framework for the assessment of technology, it is imperative to acknowledge that its theoretical generalizability may necessitate further investigation across diverse contexts to augment its applicability and efficacy.

3. Literature Review

Kulkarni (2022) describes the digital rupee as a virtual form of fiat money, distinguishing itself through instant transfers between stakeholders, lower cost of transactions, and instant payment. Compared to conventional systems that use agents, CBDCs simplify transactions, providing benefits in terms of operations (Haque & Shoaib, 2023). The reason behind the RBI's initiative towards the digital rupee is bi-fold: It aims to safeguard India's interest in the expanding virtual currency paradigm and counterbalance the increasing grip of cryptocurrencies (Lodha & Harane, 2023). The digital rupee is expected to offer a more transparent and efficient payment system, using blockchain for real-time tracking and ledger management. Lodha and Harane (2023) also highlight its ability to provide 24/7 access, wholesale and retail segment support, reduced transaction costs, quicker cross-border payments, and better monetary control without the need for users to hold bank accounts. Bhatnagr et al. (2024) point out that early adoption of CBDC can drive financial inclusion for the unbanked, lower cash dependence, and increase digital payments, thus contributing to India's economic growth.

As of Feb 2025, the implementation phases consist of 11 countries having launched CBDCs, 21 in development, 33 in pilot status, and 46 in research, while others are inactive or have dropped plans. With the Sand Dollar initiative, the Bahamas is reported as the first country to introduce a digital currency with a 7.9% adoption rate. The G20 economies are pushing forward fast, with 12 cross-border wholesale CBDC projects underway. Issuing a CBDC is likely to lower currency printing and remittance expenses. Statistics from www.data.gov.in show a downward trend in these expenses: printing expenses declined from ₹7965 crores in 2016–17 to ₹4012 crores in 2020–21, and remittance expenses dropped from ₹147 crores to ₹55 crores during the same period.

The macroeconomic benefits of CBDCs, including better monetary policy implementation, less reliance on cash, greater financial inclusion, and enhanced settlement efficiency, are further discussed by Kesavaraj et al. (2022). However, they also point out important issues like low financial literacy, a lack of technology infrastructure, and cybersecurity issues. Tokenization and hashing are two cryptographic techniques suggested to protect user privacy and transaction integrity. Research that employs well-established behavioral models sheds light on user perceptions of CBDC adoption. Using Dual-Factor Theory (DFT), Balasubramanian and Thirumaran (2024) discover that perceived government support, trialability, and perceived similarity with current technologies act as enablers. On the other hand, barriers related to perceived usage complexity, risk, and value serve as deterrents.

Perceived utility, ease of use, trust, self-efficacy, and awareness are also found to be positive predictors of adoption intention by Ogunmola and Das (2024) using the Technology Acceptance Model (TAM). Kumari et al. (2023) investigate further how behavioral intentions towards cryptocurrencies are moderated and mediated by technological awareness, financial literacy, and innovativeness. Their application of CB-SEM shows that usage intentions are significantly mediated by performance expectancy. India is in line with its peers, but it lags behind in areas like central bank independence and per capita GDP readiness, according to Eichengreen et al.'s (2022) comparison of India's CBDC progress with that of the other BRICS countries. Noting unresolved design and policy issues, they support a cautious, phased approach to CBDC implementation. Ronaghi (2023) shows how economic sanctions hasten the adoption of digital currencies based on blockchain technology in Iran. The value-based adoption model used in the study suggests that perceived value and necessity due to sanctions play a crucial role in adoption.

Numerous studies contribute to the conversation by offering theoretical frameworks and empirical data. Using a DSGE model, Xin et al. (2024) combine CBDC with green finance and demonstrate its beneficial effects on environmental objectives and green bond issuance. Using a TANK model, Fan et al. (2024) show that CBDCs increase fiscal income and welfare in small open economies. In his conceptual analysis of CBDC applications in African countries, Ozili (2024) emphasizes the value of regulatory frameworks while highlighting the tool's potential to curb the spread of counterfeit currency and informal economies.

Nonlinear time-series analysis is used by Sah and Patra (2024) to investigate the connection between digital currencies and other financial markets. Their findings point to important but unequal relationships between traditional assets and digital currencies. Studies like Gupta et al. (2023), which find that prior experience with the Unified Payments Interface (UPI) negatively moderates the influence of performance expectancy on CBDC use, provide additional context for consumer behaviour. Similar to this, Xia et al. (2023) look at China's DCEP, where privacy concerns and technological fit greatly influence adoption intentions. In their assessment of the regulatory obstacles in South Africa and Zimbabwe, Chitimira and Torerai (2023) discover a lack of policy clarity regarding the adoption of CBDCs.

In the meantime, research like that conducted by Mehlkop et al. (2023) and Dutta et al. (2023) highlights how firm performance, income levels, and privacy all influence preferences for digital payments. Research conducted specifically in India, including studies by Haque and Shoaib (2023), Bavadekar (2023), and doctoral research on user sentiments, showcases the potential and limitations of the digital rupee in changing the country's monetary system. According to the body of research, there are still many obstacles to overcome even though CBDCs, such as the digital rupee, have great potential for improving financial inclusion, operational effectiveness, and policy implementation. These include issues with cybersecurity and privacy, user skepticism, regulatory ambiguity, and gaps in the technological infrastructure.

4. Research Model

The Research model of this study as shown in Figure 1 is based on the Fit Viability Model, which consists of three constructs Task Technology Fit, Viability, and Performance.

Task Technology Fit

Task Technology Fit represents a formative construct that aligns the capabilities of technological systems with the requisites of specific tasks, essentially indicating the capacity of information technology to facilitate task execution (Goodhue and Thompson, 1995). TTF models incorporate two principal constructs: Task Characteristics and Technology Characteristics, which collectively influence the third construct, Task-Technology Fit, subsequently impacting performance or utilization. According to TTF models, the employment of information technology is contingent upon its functionality adequately supporting the activities of the user (Dishaw et al. 2002).

The interplay between task characteristics and technology characteristics is of paramount importance for optimizing user efficacy across diverse fields. Task characteristics denote the distinct attributes associated with the tasks that users are required to perform, whereas technology characteristics relate to the specific features and functionalities of the tools utilized in executing these tasks. Comprehending this interaction can markedly enhance the efficacy of technological implementations.

Task Characteristics include nature of tasks and task attributes. Tasks may exhibit variations in complexity, interdependence, and dependence on information. For instance, community health workers (CHWs) necessitate tools that correspond with their task requirements, such as temporal urgency and mobility, in order to augment performance (Gatara & Cohen, 2015). Task Attributes consist of factors such as urgency, complexity, and requirements for collaboration significantly affect the execution of tasks and the tools essential for their support (Zhang et al., 2017).

Technology Characteristics include functional Support and integration with existing tools. The technology must furnish adequate functionalities that are aligned with the task specifications. For example, mHealth tools that are congruent with the tasks of CHWs can enhance performance, although an overabundance of functionalities may result in diminished reliance on the tool (Gatara & Cohen, 2015). Effective technology characteristics encompass the capacity to integrate with other systems, as evidenced by enterprise architecture management tools that amalgamate structured and unstructured information (Hauder et al., 2013).

While the congruence of task and technology characteristics is vital for the enhancement of performance, it is equally crucial to acknowledge that discrepancies may arise. For instance, elevated functionality in mHealth tools may not invariably correspond to improved performance if it fails to align with the specific requirements of the users (Gatara & Cohen, 2015).

Viability

The viability of organizations encompasses the preparedness of their infrastructural components, which comprise economic feasibility, IT infrastructure, and organization readiness. This multifaceted construct is of paramount importance for organizations, particularly within intricate environments, as it dictates their capacity to adapt and flourish.

Economic Feasibility

Tale and Rege (2024) elucidated that economic feasibility pertaining to viability encompasses the evaluation of a project's financial dimensions, thereby ascertaining its capacity to yield adequate returns to offset expenses and liabilities. This evaluative process is imperative for stakeholders to ascertain the prospective profitability and sustainability of the project across diverse sectors. Vekinis (2023) underscores that economic feasibility constitutes a fundamental element of viability, characterized as the techno-economic competitiveness of a given technology. This assessment evaluates the cost-benefit ratio, thereby ensuring that a technology is not merely feasible but also deemed acceptable and compatible for particular applications at a designated temporal context. Segura-Ortiz (2015) elucidated that the notion of economic feasibility pertaining to viability denotes a project’s robust feasibility when its repercussions are unequivocally beneficial and align with established economic, environmental, and financial standards.

IT Infrastructure

Annam (2022) underscored that the viability of IT infrastructure is contingent upon resilience, scalability, security, and cost-effectiveness. Helali (2022) underscored the significance of information technology infrastructures across various domains, necessitating meticulous design, execution, security measures, and oversight to guarantee peak performance and sustainability. Furthermore, it addresses strategies for the effective integration of network and system infrastructures. Lightfoot (2000) emphasized that information technology infrastructure ought to facilitate the provision of high-caliber, dependable products and services, integrating comprehensive error correction mechanisms and customer support frameworks to guarantee enduring sustainability. This methodology mitigates interruptions and augments customer contentment, thereby ultimately reinforcing an organization's esteem and market position. Reid and Nollau (2016) articulated that information technology infrastructure encompasses communication networks, hardware components, operating systems, information technology services, and facilities, which collectively underpin the effective functioning of business applications.

Organization Readiness

Kirilo Moiseev (2024) emphasized that organizational readiness concerning viability entails the capacity to adapt to fluctuating market dynamics, recognize and exploit emergent opportunities, and foster a culture of innovation. Aziz and Yusof (2012) asserted that organizational readiness is vital for the successful adoption of information systems, underscoring the importance of collaborative member engagement and commitment. They delineate five antecedents that influence readiness, which ultimately enhances organizational efficiency and productivity, thereby contributing to overall viability within a competitive landscape. Elezi et al. (2014) emphasized that the concept of organizational readiness, particularly in the context of viability, encompasses the attainment of elevated prerequisites, which include employee commitment, the establishment of effective feedback mechanisms, the strategic reallocation of resources during crises, the necessary diversity across all organizational tiers, the identification of Key Viability Indicators (KVIs), and the preservation of streamlined communication networks to ensure adaptability and operational efficiency.

IS Performance

The alignment of fit and viability exerts a substantial influence on the comprehensive efficacy of information systems (IS) within organizational frameworks by ensuring that technological solutions are congruent with both institutional requirements and user anticipations. A robust alignment between the information system and its organizational milieu facilitates increased utilization, acceptance, and ultimately, superior performance outcomes. The subsequent sections provide an in- depth exploration of critical dimensions of this interrelationship.

Contemporary information systems are anticipated to bolster not only productivity but also creativity and innovation. The concept of generative fit, which pertains to the degree to which a system promotes creative outputs, is gaining significance in contemporary discourse (Avital & Te'eni, 2009). A harmonious equilibrium between user endorsement and technological proficiency significantly augments the utilization of information systems, thereby resulting in enhanced performance metrics (Hester, 2013; Ali & Money, 2005). Elevated proficiency in computing skills exerts a favorable effect on individual performance and system utilization, thereby underscoring the imperative for training to attain an optimal alignment (Ali & Money, 2005).

In contrast, a misalignment between technological provisions and organizational requisites may culminate in insufficient utilization and suboptimal performance, thereby accentuating the critical need for ongoing evaluation and modification of information systems to align with the dynamic demands of contemporary business environments.

For instance, empirical research has demonstrated that a robust alignment between Knowledge Management (KM) strategies and Strategic IT Management significantly augments KM performance (Wu and Chen, 2014). Economic feasibility and technological maturity are imperative for the successful implementation of Information Systems. Investigations into the adoption of cloud computing have indicated that organizations exhibiting high levels of fit and viability are considerably more likely to achieve success in their technological initiatives (Tripathi & Nasina, 2017).

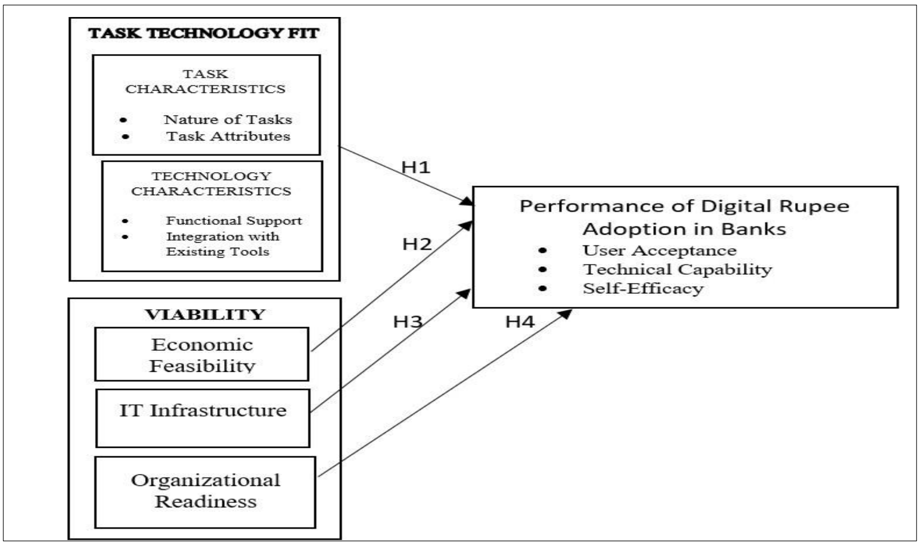

Figure 1. Research Model

5. Hypothesis Development

Goodhue (1995) elucidated the concept of task-technology fit (TTF) as the degree to which technological solutions facilitate an individual in executing his or her designated tasks. Task Technology Fit encompasses both the intrinsic attributes of the technology and the specific demands of the task at hand (Liang et al., 2007). Tasks refer to the processes undertaken by individuals in transforming inputs into outputs (Goodhue, 1995). Tasks are defined as the actions taken by individuals to achieve desired outcomes, while technologies are regarded as instruments employed by individuals to accomplish these tasks (Goodhue and Thompson, 1995). Tasks denote the operations that the digital rupee undertakes within an organizational framework. The digital rupee facilitates cross-border transactions, diminishes cash management expenditures, and enhances financial inclusion efforts (Haque and Shoaib, 2023; Patel and Barot, 2023).

Technology Characteristics pertain to the attributes of the digital rupee that contribute to the execution of the organization's tasks. Digital currency can be utilized at any time and from any location without reliance on physical cash or banking institutions. The Central Bank Digital Currency (CBDC) digital rupee can be integrated with digital identity frameworks, such as biometric verification or national identification systems, while being constructed upon Distributed Ledger Technology, including blockchain, which permits decentralized and secure transaction record-keeping (Haque & Shoaib, 2023). The CBDC digital rupee can be retained and transacted through mobile wallets, which offer a user-centric and accessible interface for engaging in CBDC transactions (Haque & Shoaib, 2023).

The CBDC digital rupee can employ application programming interfaces (APIs) to amalgamate with pre-existing payment systems and infrastructures, thereby facilitating seamless transactions across various payment platforms and enhancing interoperability (Haque & Shoaib, 2023). Liang et al. (2007) emphasized that the alignment between the characteristics of mobile technology and the attributes of tasks constitutes a pivotal factor for an organization’s adoption of such technology. For effective Task-Technology Fit, the digital rupee must present a user-friendly interface; that is, the digital rupee system ought to be easily navigable and intuitive for both commercial entities and consumers. Consequently, it is imperative to assess the influence of task-technology fit on the adoption of the digital rupee within the banking sector.

H1. CBDCs digital currency is technically fit to adopt in the Indian Banking System

The viability of the digital rupee serves a fundamental function in the evaluation of its efficacy within the organizational context. The initial dimension concerning the preparedness of an IT application pertains to its economic feasibility, which encompasses two distinct facets. The first facet involves the evaluation of the cost-benefit analysis of the specific IT initiative to ascertain whether the investment is capable of yielding sufficient financial or intangible returns; the second facet examines the potential of IT to influence transaction costs, thereby facilitating competitive advantages for the organization (Liang et al. 2007). A heightened frequency of transactions can lead to a diminution in transaction costs, consequently enhancing the utilization of particular assets (Liang et al. 2007). From the perspective of transaction costs, a reduction in these costs can augment the willingness of customers to adopt a technology. Through the adoption of the digital rupee, individuals become less dependent on cash; furthermore, the digital rupee mitigates the prevalence of illicit transactions and the circulation of black money, which could potentially enhance tax revenues, diminish corruption, improve the efficacy of economic policies, generate additional revenue, and lower the costs associated with the management, production, and distribution of physical currency (Haque & Shoaib, 2023). The digital rupee aspires to enhance the efficacy of payment systems, bolster financial inclusivity, and strengthen regulatory oversight, while concurrently addressing the prevailing shadow economy and mitigating transaction costs (Bhavsar, 2024). The digital rupee has the potential to facilitate access to financial services for marginalized demographics, thereby fostering greater economic engagement (Bhavsar, 2024). By leveraging blockchain technology, it ensures secure and traceable transactions, consequently diminishing the risks associated with cash handling (Bhavsar, 2024). The Reserve Bank of India (RBI) is positioned to execute more efficacious monetary policies through the implementation of the digital rupee (Bhavsar, 2024). Therefore, the economic feasibility attained via the digital rupee significantly affects its performance within the organizational framework.

H2. CBDCs digital currency is economically viable to adopt in the Indian Banking System.

The organizational readiness pertaining to the project encompasses critical elements such as the endorsement of upper management, digital proficiency, individual personality traits, and previous experiences (Liang et al. 2007). Organizational readiness is fundamentally a crucial factor that affects the successful implementation of interventions across various fields, notably in healthcare and technology. It encapsulates the collective willingness and capability of an organization to adapt to changes, which can significantly influence outcomes (Weiner, 2020). With respect to usability, support systems, innovative mechanisms, and minimal transaction fees, the e-Rupee will encounter competition from alternative digital payment platforms such as PAYTM, BHIM UPI, and established cryptocurrencies (Patel and Barot, 2023). India is characterized by a diverse populace that communicates in a multitude of languages. The system architecture must accommodate various languages and deliver an intuitive user experience for users who may lack proficiency in English (Haque & Shoaib, 2023). Digital currencies, including the e-Rupee, remain relatively novel and intricate technologies, and there may exist regulatory hurdles that necessitate resolution for the e- Rupee to achieve success. Presently, India has yet to establish explicit guidelines regarding the utilization of digital currencies. The adoption of a digital currency mandates the presence of sufficient digital infrastructure, education, and regulatory frameworks to guarantee its safety, reliability, and usability (Sinelnikova-Muryleva et al., 2020). The organizational readiness for the adoption of the digital rupee entails facets such as employee training, change management, clearly articulated policies and procedures, stakeholder engagement, and leadership endorsement (Raj et al., 2024). Consequently, organizational readiness, as evaluated through a supportive and well- defined regulatory framework, assessment of digital illiteracy and language barriers, along with competition from alternative payment solutions, significantly impacts the performance of the digital rupee adoption.

H3. Indian Banking system is ready to adopt CBDCs digital currency for operations

The assessment of technical infrastructure is predicated upon the sophistication of software and hardware, the efficacy of data management practices, and the proficiency of Information Systems personnel (Liang et al. 2007). The implementation of a digital currency necessitates a resilient technical infrastructure capable of accommodating the transactional volume and velocity requisite for a large-scale digital currency framework. This endeavor would mandate considerable investments in both hardware and software, in addition to comprehensive cybersecurity protocols to safeguard the security and integrity of the system (Haque & Shoaib, 2023). Digital currencies function within a legal and regulatory framework that must be conducive and precisely articulated. India presents a multifaceted regulatory landscape for financial services, and any initiative pertaining to digital currency must operate within this contextual framework while simultaneously addressing concerns related to data privacy and security (Haque & Shoaib, 2023). Finally, the architecture of Central Bank Digital Currencies (CBDCs), specifically the digital rupee, must exhibit scalability and the capacity to manage vast quantities of transactions and user accounts. This challenge can be mitigated through technological innovations and enhancements to the network infrastructure (Haque & Shoaib, 2023).

The technical infrastructure of the digital rupee necessitates a robust network; that is, a stable and dependable network infrastructure is imperative for the facilitation of seamless digital rupee transactions, ensuring expeditious and secure data transmission, as well as fortified systems to mitigate fraud and uphold the integrity of digital rupee transactions. Auer and Böhme (2020) underscored the necessity for resilient infrastructure in the technical architectures of central bank digital currencies, such as the digital rupee, to facilitate secure and efficient transactional processes, while concurrently addressing user privacy and law enforcement requirements, thereby accentuating the significance of robust network systems. The Digital Rupee functions on a blockchain-oriented framework, necessitating a resilient technological foundation to guarantee both efficacy and security. This foundation must tackle issues such as privacy apprehensions and cybersecurity vulnerabilities while enabling regulatory supervision by the Reserve Bank of India (Bhavsar 2024). Consequently, the sophistication of IT infrastructure, as evaluated through parameters such as effective internet connectivity and speed, alongside concerns regarding privacy, security, and scalability, significantly influences the operational performance of the digital rupee within organizational contexts.

H4. Technical Infrastructure has an impact on the performance of CBDC digital currency adoption in Indian banking system.

6. Research Methodology

6.1 Instrument Development

The research was meticulously formulated and conducted in the English language to mitigate inaccuracies stemming from both forward and backward translation processes. The survey underwent a preliminary testing phase involving 35 seasoned bankers (senior managers) prior to the principal investigation. The senior managers were solicited to provide their insights regarding the language, content, style, and format of the survey instrument. Subsequent to implementing a few minor modifications, the questionnaire was finalized for the primary research endeavor. Items pertaining to the construct of Task Technology Fit (TTF) and Viability were derived from the framework established by Liang et al. (2007) and adapted to the context of digital rupee applications. Specifically, four items related to TTF and ten items concerning the construct of “Viability” were extracted from the aforementioned study. Furthermore, three items associated with the construct “Economic Feasibility,” four items pertaining to “IT Infrastructure,” and three items related to “Organization Readiness” were incorporated under the formative construct of Viability. A questionnaire-based survey methodology was employed for the purpose of eliciting responses. The questions were evaluated using a Likert Scale ranging from 1 to 5, where 1 represents Strongly Disagree, 2 denotes Somewhat Disagree, 3 indicates Neutral, 4 signifies Somewhat Agree, and 5 corresponds to Strongly Agree. The utilization of a five-point Likert scale analysis in this study is justified by the ease with which respondents can provide their answers in this format, allowing them to select from the predetermined response options. The initial segment of the questionnaire is dedicated to the collection of data pertaining to the demographic characteristics of the bankers. The subsequent section focuses on gathering data related to the constructs of Task Technology Fit (TTF), Economic Feasibility, Organization Readiness, IT Infrastructure, and the Performance of Digital Rupee Adoption.

6.2 Data Collection

The participants in this study consisted of branch managers, senior managers, and deputy managers affiliated with the banking institution. Managers from a minimum of five branches of each bank, which are currently undergoing a pilot phase for the testing of digital currency, were approached for the purpose of data collection. The convenience sampling methodology was employed to identify the respondents, whereby the sample was extracted from a cohort of individuals who were readily accessible. A total of 202 responses were acquired via an online questionnaire and direct bank visits. Among the 202 responses, 153 were selected for subsequent data analysis due to the presence of incomplete or absent information.

6.3 Sample Description

In the sample, 77% of the respondents are male and 23% are female. Respondents belong to the nationalized and private banking sectors. 13 banks were selected for the study, out of which 7 belong to the public sector and the rest 6 belong to the private sector. 30 responses are from SBI followed by 25 from ICICI and 22 from HDFC banks respectively as shown in Table 1. Majority are the senior managers i.e. 38.6% followed by 20.3% branch managers and rest 15% are assistant general managers and 16% are deputy managers of the banks. Majority of the respondents i.e. 57% are more than 55 years of age with more than 35 years of experience as shown in Table 2.

Table 1. Sample Demographics 1

Bank Name	**Number of Responses**	**% Responses**	**Type of Bank**
SBI	30	19.6	Public
ICICI BANK	25	16.3	Private
HDFC BANK	22	14.4	Private
PUNJAB NATIONAL BANK	10	6.5	Public

CANARA BANK	8	5.2	Public
KOTAK MAHINDRA	8	5.2	Private
AXIS BANK	6	3.9	Private
UNION BANK OF INDIA	7	4.6	Public
IDFC FIRST BANK	5	3.3	Private
ANDHRA BANK	10	6.5	Public
BANK OF BARODA	10	6.5	Public
YES BANK	8	5.2	Private
INDIAN BANK	4	2.6	Public

Table 2. Sample Demographic2

Age Group	**Number of Responses**	**% Responses**
25-35 years	30	19.6
36-45 years	36	23.5
46-55 years	45	29.4
56-75 years	42	27.5
Experience	**Number of Responses**	**% Responses**
<10 years	25	16.3
11-20 years	41	26.8
21-30 years	31	20.3
31-40 years	56	36.6
Designation	**Number of Responses**	**% Responses**
Senior Manager	59	38.6
Deputy Manager	25	16.3
Assistant General Manager	23	15
Branch Manager	31	20.3

Credit Manager	15	9.8

7. Data Analysis and Results

7.1 Assessing Data Validity

Examining the variance's normalcy is the first step in the data analysis process. The findings demonstrated that all item estimations for skewness and kurtosis fell within the permissible range (Tabachnic & Fidell, 2007), supporting the consistency of the items. Second, a common problem is common method variance (CMV). The study concluded that CMV was treated primarily (Podsakoff et al., 2003). To evaluate the potential threat of CMV, a full collinearity test proposed by Kock (2015) was adopted, in which the internal VIF value should be less than or equal to 3.3. According to the test results, all internal VIF values are less than the cut-off value, as shown in Table 3. This shows that the model is not affected by multicollinearity.

Table 3. Internal VIF values

Items	**VIF**
EF1	1.785
EF2	1.762
EF3	1.992
ITF2	1.982
ITF3	2.233
ITF4	2.087
OR1	1.484
OR2	1.484
PER1	1.838
PER2	2.274
PER3	1.97
TTF1	1.478
TTF2	1.586
TTF3	1.383
TTF4	1.274

7.2 Assessing Results of Reflective Measurement Models

Assessment of reflective measurement models includes composite reliability to evaluate internal consistency, individual indicator reliability, and average variance extracted (AVE) to evaluate convergent validity. Assessment of reflective measurement models also includes discriminant validity. The Fornell-Larcker criterion, cross-loadings, and especially the heterotrait-monotrait (HTMT) ratio of correlations can be used to examine discriminant validity.

Table 4. Outer Loadings Matrix

	EF	**ITF**	**OR**	**PER**
EF1	0.881			
EF2	0.853			
EF3	0.808			
ITF2		0.833		
ITF3		0.842		
ITF4		0.856		
OR1			0.869	
OR2			0.889	
PER1				0.845
PER2				0.873
PER3				0.872

All the first-order factors, as indicated in Table 4, have strong factor loadings that are significant and higher than the suggested level of 0.70 as suggested by Hair et al. (2021). Due to inadequate loading, two items OR3 and ITF1 were eliminated from the model. In order to retrieve composite reliability and convergent validity, values of Cronbach's alpha, rho_a, composite reliability, and average variance were extracted for all the factors (See Table 5 and 6). The factors' composite reliability and Cronbach's alpha surpasses the recommended threshold levels of 0.70 and 0.80, respectively. (Hair et al., 2021). This implied that the internal consistency of the measurement model is sufficient. Since the values of average variance extracted for each item were found to be more than the.50 criterion, convergent validity was proven (Hair et al., 2021). Table 6 shows the discriminant validity for each construct, the square root of the average variance extracted (AVE) was higher than the correlations it shared with other components, as suggested by Fornell and Larcker (1981).

In the present study as shown in Table 6, R Square for performance is 0.559; $P<0.01$, which is significant (Falk & Miller, 1992), which shows satisfactory variance in performance explained by the exogenous variables (EF, ITF, OR and TTF). The Q square value for performance is 0.559. Q values more than zero indicating the predictive relevance of a model as suggested by Hair et al., 2017 and Cin, 2010. Additionally, HTMT (Heterotrait-Monotrait Ratio Criterion) was examined (See Table 7) as suggested by Heseler, Ringle, and Sarstedt (2015) that discriminant validity is established when all HTMT values are less than 0.85. In this study, HTMT values of all the items were found less than 0.85. SRMR stands for Standardized Root Mean Square Residual. This value is a measure of model fit (model fit), namely the difference between the data correlation matrix and the estimated model correlation matrix (Yamin, 2023). SRMR below 0.08 indicates a fit model ((Hair et al, 2021). The result of this study showed SRMR value of 0.07 in Table 6.

Table 5. Convergent Validity and Reliability

Construct	**Cronbach's alpha**	**Composite reliability (rho_a)**	**Composite reliability (rho_c)**
EF	0.810	0.846	0.884
ITF	0.798	0.80	0.881
OR	0.706	0.708	0.872
PER	0.829	0.830	0.898

Table 6. Discriminant Validity and Model Fit

Constructs	**EF**	**ITF**	**OR**	**AVE**	**R-Square**	**F-Square**	**Q-Square**	**SRMR**
EF	-	-	-	0.719	-	0	-	-
ITF	0.758	-	-	0.712	-	0.077	-	-
OR	0.809	0.899	-	0.772	-	0.147	-	-
PER	0.627	0.755	0.885	0.745	0.559	-	0.501	0.07
TTF	-	-	-	-	-	0.088	-	-

Note n=540; Square root values of AVE for all the constructs are located on the diagonal; inter-construct correlations are found at lower diagonal values.

Table 7. HTMT Matrix

	EF	**ITF**	**OR**	**PER**
EXP	0.099			
ITF	0.728			
OR	0.754	0.814		

PER	0.577	0.771	0.818	
TYPE	0.073	0.083	0.047	0.057

7.2 Assess Convergent Validity of Formative Construct (TTF)

After model estimation, different metrics are used to assess formative measures for convergent validity, the significance and relevance of indicator weights, and the presence of collinearity among indicators. Convergent validity is the extent to which a measure correlates positively with other (e.g., reflective) measures of the same construct using different indicators. Hence, when evaluating formative measurement models, it is required to test whether the formatively measured construct is highly correlated with a reflective measure of the same construct. This type of analysis is also known as redundancy analysis (Chin, 1998).

Redundancy Analysis for testing convergent validity of formative construct (TTF)

The strength of the path coefficient (at a minimum 0.70 and above) linking the two constructs is indicative of the validity of the set of formative indicators, which translates into an R2 value of at least 0.50 (Hair et al., 2024). Here in this study, the indicators of TTF showed the path coefficient of 0.803 with an R2 value of 0.645, as shown in Figure 2. This satisfies the criteria of convergent validity of the formative construct TTF.

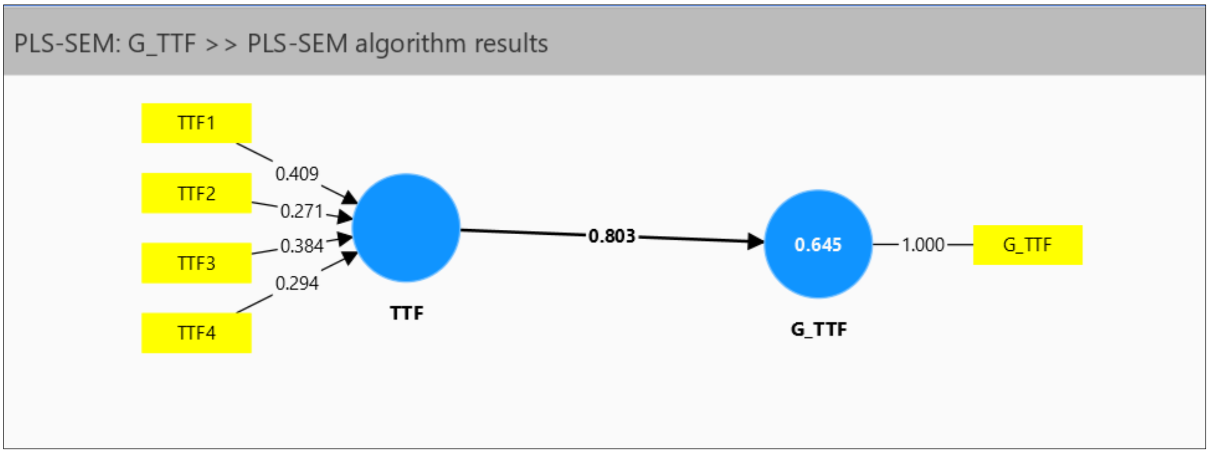

Figure 2. Redundancy Analysis for testing convergent validity of formative construct (TTF)

7.3 **Assess Formative Measurement Models for Collinearity Issues**

Unlike reflective indicators, which are essentially interchangeable, high correlations are not expected between items in formative measurement models. In fact, high correlations between two formative indicators, also referred to as collinearity. The most severe form of collinearity occurs if two (or more) formative indicators are entered in the same block of indicators with exactly the same information in them (i.e., they are perfectly correlated). This situation may occur because the same indicator is entered twice or because one indicator is a linear combination of another indicator. High levels of collinearity between formative indicators are a crucial issue because they have an impact on the estimation of weights and their statistical significance. In the context of PLS-SEM, a tolerance value of 0.20 or lower and a VIF value of 5 or higher, respectively, indicate a potential collinearity problem (Hair et al., 2021). If the level of collinearity is very high, as indicated by a VIF value of 5 or higher, one should consider removing one of the corresponding indicators. Outer weights in formative measurement models should be analyzed for their significance and relevance only if collinearity is not at a critical level (Hair et al, 2021). Here in this study, Internal VIF values of all the constructs are below 3 as shown in Table 8. Hence, the collinearity issue is not present in the items of the formative construct "TTF".

7.5 Measurement Model Analysis of Formative Construct TTF (Assess the Significance and Relevance of the Formative Indicators)

The absolute contribution is given by the formative indicator's outer loading, which is always provided along with the indicator weights. Outer weight and outer loading of all the TTF items are shown in Tables 8 and 9. When an indicator's outer weight is nonsignificant but its outer loading is high (i.e., above 0.50), the indicator should be interpreted as absolutely important but not as relatively important. In this situation, the indicator of formative construct would generally be retained (Hair et al., 2021).

Here in this study, all the indicators of TTF show significant outer loadings as shown in Table 9. Hence, all the indicators are retained for further analysis.

Table 8. Outer Weights

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
TTF1 -> TTF	0.688	0.682	0.114	6.027	0
TTF2 -> TTF	0.337	0.328	0.132	2.554	0.011
TTF3 -> TTF	0.151	0.149	0.117	1.287	0.198
TTF4 -> TTF	0.088	0.088	0.137	0.641	0.521

Table 9. Outer Loadings

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
TTF1 -> TTF	0.907	0.891	0.054	16.89	0
TTF2 -> TTF	0.719	0.699	0.095	7.536	0
TTF3 -> TTF	0.571	0.554	0.114	5.005	0
TTF4 -> TTF	0.533	0.519	0.118	4.501	0

8. Assessing PLS-SEM Structural Model Results

Structural model assessment in PLS-SEM focuses on evaluating the significance and relevance of path coefficients, followed by the model's explanatory and predictive power. As shown in Model fit Table 6, F-Square is the change in R-Square when an exogenous variable is removed from the model and is called the effect size. F^2 values of 0.02, 0.15, and 0.35, respectively, represent small, medium, and large effects (Cohen, 1988) of the exogenous latent variable. Effect size values of less than 0.02 indicate that there is no effect. F^2 value (0.00) of the construct (EF) showed no effect, whereas F2 values of other constructs show a moderate effect on the endogenous variable (PER). Q^2 value of dependent variable “performance” has a value more than zero (0.50), indicating the path model’s predictive relevance for a particular dependent construct.

8.1 Hypotheses, Results, and Discussions

The first aspect related to the readiness of an IT application is the economic feasibility, which includes two different aspects. One is to assess the cost-benefit of the particular IT project to see whether the investment can bring in adequate financial or intangible returns; the other is to see whether IT can affect the transaction costs and hence lead to competitive advantages to the organization (Liang et al., 2007). As shown in Table 10 and Figure 3, economic feasibility does not have a significant relationship with the performance of digital rupee adoption. The results coincide with the statement made by senior managers of Axis and SBI Banks that the digital rupee is in the pilot phase of implementation; hence, in the absence of volume of transactions and infrastructure cost details, economic feasibility cannot be a factor in the evaluation of the performance of digital rupee adoption. Other constructs, IT Infrastructure, Organization Readiness, and Task Technology Fit, have a significant and positive impact on the performance of digital rupee adoption. This result coincides with the findings of Raj et al. (2024) that strong IT infrastructure, organizational readiness, and a good task-technology fit are crucial for successful digital rupee adoption, which positively impacts its performance and user experience.

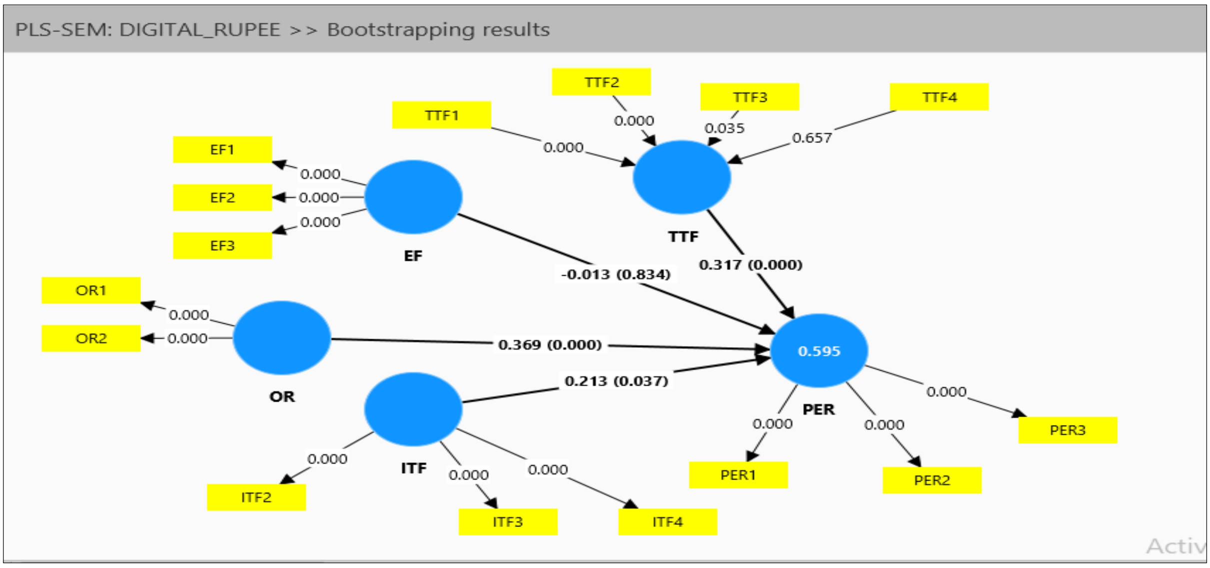

Figure 3. Structural Model in Smart-PLS 4

Table 10. Hypotheses Result

Paths	**Original sample (O)**	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics (|O/STDEV|)**	**P values**
EF -> PER	-0.005	0.015	0.078	0.059	0.953
ITF -> PER	0.255	0.242	0.116	2.206	0.027
OR -> PER	0.363	0.352	0.111	3.28	0.001
TTF -> PER	0.26	0.277	0.085	3.054	0.002

8.2 The importance-performance map analysis (IPMA)

IPMA extends the results of PLS-SEM by taking the performance of each construct into account. Standard PLS-SEM analyses provide information on the relative importance of constructs in explaining other constructs in the structural model (Ringle & Sarstedt, 2016;

Rigdon et al., 2011 and Schloderer et al., 2014). Information on the importance of constructs is relevant for drawing conclusions. As a result, conclusions can be drawn on two dimensions (i.e., both importance and performance), which is particularly important in order to prioritize managerial actions (Hair et al., 2024). Consequently, it is preferable to primarily focus on improving the performance of those constructs that exhibit a large importance regarding their explanation of a certain target construct, but, at the same time, have a relatively low performance. Performance and Importance scores of each construct are given in Table 11.

An IPMA relies on total effects and the rescaled latent variable scores, both in an unstandardized form. Rescaling the latent variable scores is important to facilitate the comparison of latent variables measured on different scale levels. The x-axis represents the (unstandardized) total effects of EF, OR, ITF and TTF on the target construct PER (i.e., their importance). The y-axis depicts the average rescaled (and unstandardized) latent variable scores of EF, OR, ITF and TTF (i.e., their performance).

Table 11. Importance-Performance Map Analysis Results

	Importance	Performance
EF	-0.013	77.690
ITF	0.213	77.107
OR	0.369	73.295
TTF	0.317	76.274

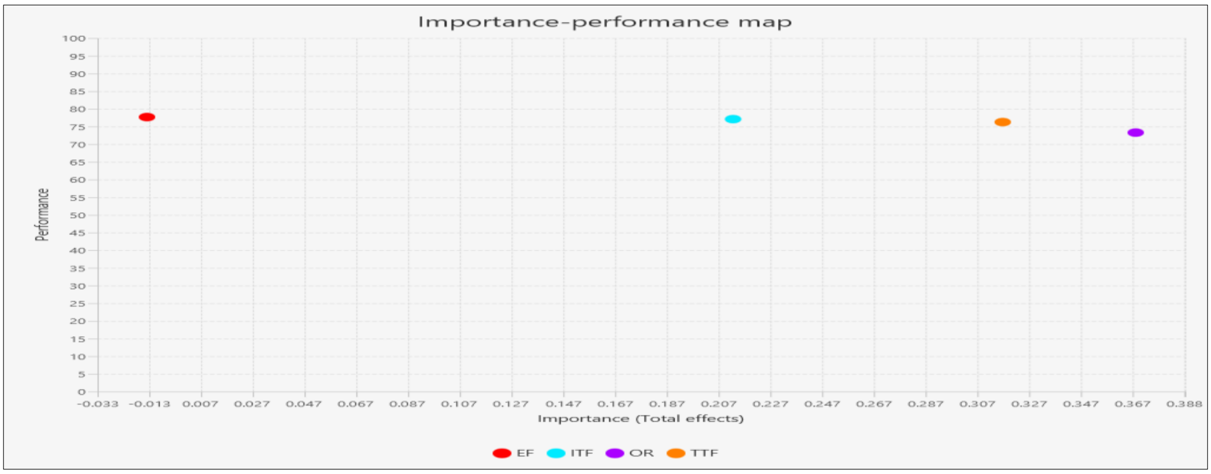

Figure 4. Importance-performance Map [PER] Constructs)

As can be seen in Figure 4, constructs in the lower right area of the importance-performance map have a high importance for the target construct but show a low performance. Hence, there is a particularly high potential for improving the performance of the constructs positioned in this area. Constructs with lower importance, relative to the other constructs in the importance-performance map, have a lower priority for performance improvements. In fact, investing in the performance improvement of a construct that has a very small importance for the target construct would not be logical, since it would have little impact in changing (improving) the target construct. In this study, as shown in Table 11, OR is particularly important for explaining the target construct PER. In a ceteris paribus situation, a one-unit increase in the performance of OR increases the performance of PER by the value of its total effect, which is 0.369. Ceteris paribus is a Latin phrase that generally means "all other things being equal." In economics, it acts as a shorthand indication of the effect, one economic variable has on another, provided all other variables remain the same. At the same time, the performance of OR is relatively low, so there is substantial room for improvement. Consequently, construct OR is the most relevant for managerial actions in the PLS path model example.

9. Conclusions and Implications

This study contributes to the literature on understanding the successful adoption of digital currency. This study contributes to the literature of both task technology fit and the fit viability model in understanding the successful adoption of technology in firms. This study helps government and practitioners in finding the status of the digital rupee from the perspective of bankers in the context of its adoption in banks. The implications of our study on adopting the digital rupee in India using the Fit-Viability Model (FVM) are broad and significant.

The study provides critical insights for policymakers, notably the Reserve Bank of India (RBI) and the government, in designing and implementing the digital rupee. Understanding the fit between the digital rupee's characteristics and user needs, as well as its organizational viability, can guide the formulation of policies that enhance adoption and performance. The findings can help in shaping a regulatory framework that addresses key challenges identified in the study, such as security, data privacy, and interoperability. Policies can be tailored to ensure that the digital rupee aligns with the needs of both banks and the general public.

If the study finds significant gaps in digital literacy or social readiness, it could prompt the government to invest in public awareness campaigns and educational initiatives to improve understanding and acceptance of digital currency. If the digital rupee is found to be viable and well-aligned with user needs, it could have a significant impact on financial inclusion in India. The study might suggest ways to tailor digital currency better to serve unbanked populations, particularly in rural areas. By enabling faster, more secure, and more efficient transactions, the digital rupee could contribute to economic growth. The study’s findings could support arguments for broader digital transformation in India's financial system, leading to increased efficiency and reduced transaction costs.

10. Future Research Directions

The study could contribute to the theoretical refinement of the FVM by applying it in a new context—digital currency adoption in a developing economy. This may lead to new insights or modifications of the model to better capture the complexities of digital currency implementation. The study could pave the way for longitudinal research that tracks the adoption and impact of the digital rupee over time. Future studies could build on this pilot to assess the long-term viability and success of digital currency in India.

The findings might inspire comparative studies between India and other countries that have adopted or are considering digital currencies. This could help identify best practices and lessons that can be applied across different contexts. While this study focuses on the banking sector, its methodology and findings could be applied to other sectors, such as retail, healthcare, or government services, to explore the broader implications of digital currency adoption.

Ethical Statement

1. The authors have affirmed the originality of their scholarly work, that no data was either fabricated or falsified, and that the manuscript was not concurrently under review for publication in another venue.
2. This study was approved by IBS Hyderabad, The ICFAI Foundation for Higher Education (Declared as Deemed-to-be University u/s 3 of the UGC Act, 1956), and informed consent was obtained from all participants. All procedures were performed in accordance with the Declaration of Helsinki (revised 2013).

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