Environment and Social Psychology (2024) Volume 9 Issue 9
doi: 10.59429/esp.v9i9.2983

RESEARCH ARTICLE

Applying innovation diffusion theory to blockchain adoption in Indian private sector banks

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ABSTRACT

The adoption of blockchain technology in the banking sector has gained significant attention due to its potential to improve operational efficiency, transparency, and security. The study aims to investigate how the relative advantage, compatibility, complexity, observability, and trialability of blockchain, as proposed by Rogers' diffusion of innovation theory, impact the adoption behavior of private sector banks in India. The study employed a quantitative approach, using a quantitative survey to collect data from 250 employees in the banking industry. The collected data was analyzed using the PLS-SEM technique with the help of SmartPLS software. According to the findings of the study, relative advantage, compatibility, and trialability have a major impact on blockchain behavioral intention, which further impacts actual usage behavior. Blockchain behavioral intention partially mediates between relative advantage, compatibility, trialability and usage behavior. The study also discovered that complexity and observability do not influence blockchain adoption among private banks in India. As per the study, private sector banks in India should focus on promoting the relative advantages, compatibility, and trialability of blockchain technology to enhance adoption. Hence, efforts should prioritize demonstrating blockchain's benefits and ease of integration while offering trial opportunities, as complexity and observability do not significantly impact adoption decisions.

Keywords: Blockchain adoption; Innovation diffusion theory; Usage behavior; Adoption Behaviour; Banking Industry

1. Introduction

Blockchain technology is quickly becoming a powerful tool that has the potential to transform a variety of industries, including banking. It offers numerous advantages, such as improved operational efficiency, enhanced security, and reduced costs, that are increasingly catching the attention of private sector banks in India. This reflects a global trend of embracing blockchain technology. The adoption of blockchain technology by private sector banks in India has emerged as a pivotal area of research, especially in the context of enhancing operational efficiency and customer trust. As the financial landscape evolves, it is

ARTICLE INFO
Received: 21 July 2024 | Accepted: 4 September 2024 | Available online: 20 September 2024

CITATION
Pooja J, Bhuvanesh KS, Ritesh K,et al. Applying Innovation Diffusion Theory to Blockchain Adoption in Indian Private Sector Banks. *Environment and Social Psychology* 2024; 9(9): 2983. doi: 10.59429/esp.v9i9.2983

essential to understand the factors influencing the adoption behavior of these institutions. Innovation Diffusion Theory (IDT) provides a robust framework for exploring how new technologies, such as blockchain, are perceived and adopted within organizations. This theory posits that various attributes, including relative advantage, complexity, compatibility, trialability, and observability, influence the adoption of innovations.

With the emergence of blockchain solutions, private sector banks have the opportunity to transform traditional banking systems, facilitating transparency and security in transactions. However, the rate and extent of adoption are contingent upon the perceptions of key stakeholders regarding the benefits and challenges associated with this technology. Furthermore, the Indian banking sector, characterized by its dynamic regulatory framework and diverse technological landscape, serves as a unique environment for exploring these phenomena. Understanding the perception towards using blockchain technology will not only aid in the successful implementation of this innovation but also provide valuable insights for policymakers and practitioners aiming to foster technological advancement in the banking industry. Thus, this study aims to apply the Innovation Diffusion Theory to analyze the factors affecting the perception and usage behavior of blockchain adoption in private sector banks in India.

The primary objective of this research is to examine the utilization of blockchain technology by private sector banks in India through the lens of Everett Rogers' Innovation Diffusion Theory (IDT). The IDT serves as a comprehensive framework for the analysis of how innovations are adopted and disseminated within a social system. This study delves into the impact of Rogers' Theory on the adoption of blockchain by private sector banks in India, with a specific focus on the influence of factors such as relative advantage, compatibility, complexity, observability, and trialability on management decisions. Through the application of this theory, the research provides a nuanced understanding of the dynamics surrounding blockchain adoption within the Indian banking sector. The insights derived from this study hold significant value for policymakers, banking professionals, and technology providers, as they illuminate key drivers and obstacles to adoption and offer guidance for formulating strategies to expedite the integration of blockchain within India's private banks. This study is of both academic and practical importance. From an academic standpoint, it addresses an existing gap in the literature by employing a well-established theory to explore the adoption of blockchain, shedding light on the potential applicability of traditional theories to modern innovations. In practical terms, it offers actionable insights for stakeholders in the banking sector, facilitating the development of strategies to overcome challenges and harness the benefits of blockchain. Additionally, the findings of this study have the potential to influence future research in fintech and digital transformation, ultimately shaping real-world practices in the banking sector by fostering innovation and technological advancement.

2. Theoretical development and Hypothesis development

2.1 Blockchain Technology and Innovation Diffusion Theory

Everett Rogers' innovation diffusion theory explains how innovations are adopted and spread within a social system. The qualities of an innovation, according to the innovation diffusion theory, impact its acceptance [1]. Blockchain technology offers distinct qualities that may influence its acceptance in banks, including decentralization, transparency, and immutability. These qualities can influence how banks perceive the benefits and hazards of implementing blockchain technology and so influence its adoption within the banking industry. For the acceptance of innovations, the innovation diffusion theory offers a five-stage process: relative advantage, compatibility, complexity, observability, and trialability. When exploring and deploying blockchain technology, banks may go through these stages. Banks, for example, may become aware of blockchain technology and its potential benefits during the knowledge stage. Banks may examine the benefits and drawbacks of adopting blockchain technology during the persuasive stage. Banks may choose to accept or reject blockchain technology during the decision stage. Banks may install blockchain solutions during the implementation stage, and banks may evaluate the results of their adoption efforts during the confirmation step. The relationship between blockchain technology and the innovation diffusion theory entails considering the characteristics of the invention, the adoption process, adopter categories, communication channels, and the social structure in which banks operate [2][3]. This research can shed light on how and why blockchain technology might be adopted and spread inside the banking industry.

2.2 Hypothesis development

2.2.1 Relative Advantage (RA) and Blockchain Adoption Intention (BAI)

Relative advantage is a critical factor influencing the adoption of new technologies, as it reflects the perceived benefits of an innovation over existing methods or systems. The concept, rooted in Rogers' Innovation Diffusion Theory (IDT), suggests that the greater the perceived superiority of an innovation, the more likely it is to be adopted [4]. Studies consistently demonstrate that when potential users perceive clear advantages—such as increased efficiency, cost savings, or enhanced functionality—they are more inclined to adopt the technology [5,6]. In the context of blockchain technology, relative advantage plays a pivotal role in shaping adoption intentions. Blockchain offers several distinct advantages over traditional systems, including improved security, transparency, and the elimination of intermediaries, which contribute to cost reductions and operational efficiencies. These benefits align closely with what Rogers describes as a relative advantage, making blockchain particularly appealing to industries such as finance, supply chain management, and healthcare, where these improvements can lead to significant competitive advantages [7].

Empirical research further supports the positive impact of relative advantage on adoption intentions. For example, [8], through the Unified Theory of Acceptance and Use of Technology (UTAUT), found that performance expectancy, a concept closely related to relative advantage, is a strong predictor of technology adoption. Similarly, in the realm of financial technologies, users' perceptions of blockchain's advantages—such as increased transaction speed, reduced fraud, and greater transparency—have been shown to significantly influence their intention to adopt the technology [9,10]. These findings suggest that the more users perceive blockchain technology as advantageous relative to existing systems, the stronger their intention to adopt it, which in turn positively influences their usage behavior. Therefore, the alternative hypothesis that relative advantage positively and significantly affects blockchain adoption intention toward usage behavior is well-supported by both theoretical frameworks and empirical evidence across various technological contexts. Based on the literature, we posit:

H1: Relevant advantage has a positive and significant effect on the adoption intention of blockchain technology towards usage behavior in private banks.

2.2.2 Complexity (CPX) and Blockchain Adoption Intention (BAI)

Complexity refers to the perceived difficulty of understanding, implementing, and integrating new technologies, such as blockchain, into existing systems and processes. According to Rogers' Innovation Diffusion Theory (IDT), the complexity of an innovation can significantly influences the rate and extent of its adoption. Innovations perceived as more complex are often adopted at a slower pace and may encounter resistance from potential users [11,12]. In the context of private banks, where operational stability and seamless integration are critical, the perceived complexity of blockchain technology can create substantial barriers to adoption. The Technology Acceptance Model (TAM) further emphasizes the importance of perceived ease of use, which is inversely related to complexity, as a critical factor influencing users' intention to adopt new technologies [13]. When technology is perceived as difficult to use, it can generate resistance among potential adopters, thereby hindering its adoption [14]. This is particularly relevant for blockchain, a technology often characterized by its technical intricacies, such as cryptographic processes, distributed ledgers, and consensus mechanisms. For private banks, where employees may not be familiar with such advanced technologies, the perceived complexity of blockchain can be a significant deterrent.

Research specific to blockchain adoption has highlighted the negative impact of complexity on adoption intention. [15], in their study on blockchain technology in supply chains, found that perceived complexity significantly hindered adoption intentions, as users were discouraged by the steep learning curve and the necessity for specialized knowledge. Similarly, [16] reported that the perceived complexity of blockchain technology negatively influenced bankers' adoption intentions, as they found it challenging to implement and integrate into existing banking systems.

In the context of private banks, these findings suggest that complexity acts as a critical barrier to the adoption of blockchain technology. The higher the perception of complexity, the lower the likelihood that private banks will adopt blockchain due to concerns over integration difficulties, training costs, and potential disruptions to existing processes [17,18]. To mitigate these challenges, it is essential to reduce the perceived complexity of blockchain through targeted education, comprehensive training programs, and the development of user-friendly interfaces. By addressing these factors, private banks can enhance their adoption rates and more effectively leverage the benefits of blockchain technology. Therefore, we propose:

H2: Complexity has a negative significant effect on the adoption intention of blockchain technology towards usage behavior in private banks.

2.2.3 Compatibility (COMP) and Blockchain Adoption Intention (BAI)

Compatibility refers to the degree to which an innovation, such as blockchain technology, aligns with existing systems, processes, and infrastructure without causing significant disruptions or requiring extensive changes. In the banking industry, this concept is critical, as the seamless integration of new technologies with existing banking practices and IT infrastructure is essential for successful adoption. The hypothesis suggests that the higher the compatibility of blockchain technology with existing banking systems, the more likely banks are to adopt and implement blockchain in their operations [17]. According to Rogers' Innovation Diffusion Theory (IDT), compatibility—the extent to which an innovation aligns with the existing values, experiences, and needs of potential adopters—is a key factor that positively influences the adoption of new technologies [19]. When a technology is perceived as compatible with an organization’s existing processes and systems, it is more likely to be adopted, as it minimizes the perceived risk and disruption associated with the adoption process. Empirical studies across various technological domains have consistently validated the positive relationship between compatibility and adoption intention. [20] found in their meta-analysis that compatibility is one of the most significant predictors of innovation adoption. This finding is particularly relevant in the context of information systems and digital technologies. For example, [21] demonstrated that in the banking sector, when blockchain technology was perceived as compatible with existing banking practices and IT infrastructure, the likelihood of its adoption increased significantly. Similarly, [22] showed that in e-business contexts, higher compatibility with current processes and workflows led to greater adoption rates of new technologies.

In the specific context of blockchain technology, which represents a paradigm shift for many traditional banking systems, compatibility is especially crucial. Blockchain’s alignment with a bank's existing IT infrastructure, regulatory requirements, and strategic goals can significantly influence its adoption. For instance, [23] found that perceived compatibility significantly influenced the adoption of blockchain in supply chain management, a finding that can be extrapolated to the banking sector, where integration with legacy systems is paramount. These findings suggest that the more compatible blockchain technology is with the existing systems, processes, and values of private banks, the more likely it is to be adopted. Thus, the hypothesis that compatibility has a positive and significant effect on the adoption intention of blockchain technology toward usage behavior in private banks is well-supported by both theoretical frameworks and empirical evidence across various technological settings. Hence, we posit:

H3: Compatibility has a positive and significant effect on the adoption intention of blockchain technology towards usage behavior in private banks.

2.2.4 Observability (OBS) and Blockchain Adoption Intention (BAI)

Observability refers to the degree to which the results or outcomes of an innovation, such as blockchain technology, are visible and easily discernible to potential adopters. According to Rogers' Innovation Diffusion Theory (IDT), innovations that are more observable tend to be adopted more rapidly, as potential adopters can witness the benefits and outcomes firsthand, which reduces uncertainty and increases confidence in the innovation [19]. In the context of blockchain technology, observability plays a crucial role in influencing adoption intentions, particularly in industries like banking, where decision-makers are often cautious about adopting new technologies. The hypothesis suggests that observability will positively affect the adoption of blockchain in banking. When the outcomes of blockchain technology, such as enhanced security, transparency, and operational efficiency, are visible to potential adopters in the banking industry, the likelihood of adoption increases. This visibility allows banks to see tangible proof of the technology's benefits, making them more likely to adopt it [24]. Empirical studies have consistently highlighted the importance of observability in the adoption process. [20] found that innovations with higher observability are adopted more quickly because potential adopters can easily see and understand the benefits. This finding is echoed in the context of technology adoption, where [25] demonstrated that the visibility of positive outcomes associated with an innovation significantly increased the likelihood of its adoption.

In the specific context of blockchain technology, its observable benefits—such as improved transaction speeds, reduced fraud, and greater transparency—can significantly influence adoption intentions within the banking sector. [24] found that when the results of blockchain implementations were visible to decision-makers, such as through successful case studies or pilot projects, the intention to adopt blockchain within banks increased substantially. Similarly, [26] observed that the demonstrable successes of blockchain in peer organizations acted as a powerful driver for adoption, as these observable outcomes helped mitigate uncertainties and built trust in the technology. These findings suggest that the more observable the outcomes of blockchain technology are to private banks, the more likely they are to adopt it. The visibility of blockchain's benefits serves as a crucial factor in overcoming the inherent risks and uncertainties associated with adopting new technologies in the banking sector. Thus, the hypothesis that observability has a positive and significant effect on the adoption intention of blockchain technology towards usage behavior in private banks is well-supported by both theoretical insights and empirical evidence. Therefore, we hypothesize:

H4: Observability has a positive and significant effect on the adoption intention of blockchain technology towards usage behavior in private banks.

2.2.5 Trialability (TRIA) and Blockchain Adoption Intention (BAI)

Trialability refers to the extent to which an innovation can be experimented with or tested in a controlled setting before full-scale adoption. This concept, rooted in Rogers' Innovation Diffusion Theory (IDT), plays a crucial role in the adoption of new technologies, particularly in industries where the risks of large-scale implementation are high. In the context of blockchain technology within the banking industry, the hypothesis suggests that the higher the level of trialability, the more likely banks are to adopt and implement blockchain in their operations. The ability to trial and test blockchain technology in a controlled environment allows banks to take a gradual and incremental approach to its adoption. By starting with small-scale trials or pilot projects, banks can assess the viability, effectiveness, and potential benefits of blockchain in specific use cases or business areas. These trials reduce the risks associated with full-scale implementation, as banks can expand the use of blockchain gradually based on the results of these preliminary experiments [27].

Empirical studies have consistently shown that trialability is a significant factor influencing the adoption of new technologies. For instance, [28] found that trialability positively influenced the adoption of Internet banking, as it allowed users to experience the technology's benefits without requiring a full commitment. Similarly, [29] demonstrated that in the context of information systems, the ability to trial a system before adoption significantly increased users' intention to adopt it, as it provided an opportunity to evaluate the system’s potential without the risks associated with a full-scale rollout. Specific to blockchain technology, trialability is particularly important due to the perceived complexity and novelty of the technology. In the banking sector, where the stakes for technology adoption are high, the ability to pilot blockchain solutions can significantly reduce uncertainty and enhance confidence in the technology’s potential benefits. [24], in their research on blockchain adoption in financial services, found that when banks conducted trials or pilot projects with blockchain, their intention to adopt the technology increased. These trials provided tangible evidence of blockchain's effectiveness and feasibility within the banks' specific contexts, making decision-makers more comfortable with the idea of broader adoption.

Additionally, [30] emphasized that trialability plays a critical role in the adoption of complex technologies in conservative industries like banking. By allowing organizations to build trust in the technology through firsthand experience, trialability helps overcome initial resistance and skepticism, leading to a higher likelihood of adoption. Therefore, the hypothesis that trialability has a positive and significant effect on the adoption intention of blockchain technology towards usage behavior in private banks is strongly supported by both theoretical frameworks and empirical evidence. Providing opportunities for trialability can be an effective strategy for banks to overcome barriers to blockchain adoption, increase their confidence in the technology, and ultimately integrate it into their operations.

H5: Trialability has a positive and significant effect on the adoption intention of blockchain technology towards usage behavior in private banks.

2.2.6 Blockchain Adoption Intention and Usage Behaviour

Blockchain technology has emerged as a transformative force across various industries, offering significant benefits such as enhanced security, transparency, and efficiency in operations. Understanding the factors that drive blockchain adoption and its subsequent usage behavior is crucial for organizations and individuals aiming to leverage its full potential. The hypothesis that "Blockchain Adoption Intention has a significant effect on usage behavior towards blockchain" is supported by a growing body of literature that examines the relationship between adoption intention and actual usage behavior in the context of emerging technologies. The Technology Acceptance Model (TAM), developed by [13], posits that perceived usefulness and perceived ease of use are critical determinants of users’ intention to adopt technology, which in turn influences actual usage behavior. Extending this model to blockchain, research suggests that users' adoption intention is a strong predictor of how they engage with blockchain technology [8]. Previous studies emphasized that the perceived value of decentralization and the immutable nature of blockchain records strongly influence the intention to adopt the technology. Similarly, perceived benefits significantly enhance users’ intention to adopt blockchain, which subsequently predicts their engagement and frequency of use.

Empirical studies demonstrate that a positive adoption intention towards blockchain directly translates into higher usage behavior. It has also been found that intention to adopt blockchain positively influenced actual usage behavior, as users perceived it to improve transparency and traceability. Similarly, the intention to adopt blockchain is not merely a theoretical construct but is actively linked to the behavioral outcomes seen in real-world applications.

H6: Blockchain Adoption Intention has a positive and significant effect on Usage Behaviour in private banks.

2.2.7 Blockchain adoption intention mediates the relationship between relative advantage, compatibility, complexity, observability, and trialability with usage behaviour towards blockchain.

perceived relative advantage is a critical predictor of technology adoption intention [19]. For blockchain, the intention to adopt plays a crucial role in translating the perceived advantages into actual usage behavior, as users are more likely to engage with a technology that they perceive as superior to existing alternatives. This suggests that the intention to adopt blockchain could mediate the relationship between relative advantage and usage behavior. In the blockchain context, compatibility with current business processes and user expectations enhances the likelihood of adoption. If users perceive blockchain as compatible with their needs, they are more likely to develop an intention to adopt it, which in turn influences actual usage behavior. This mediating effect of adoption intention is crucial, as without alignment, even a superior technology like blockchain might struggle to gain traction. Perceived complexity can negatively impact adoption intention, subsequently affecting usage behavior. Therefore, the intention to adopt blockchain can mediate the effect of complexity on usage behavior, where even if blockchain is perceived as complex, a strong intention to adopt might still drive usage, perhaps due to perceived necessity or potential benefits. Observability might relate to visible improvements in operational transparency or efficiency. When these outcomes are observable, they can foster adoption intention, which in turn influences actual usage behavior [15]. This suggests that observability impacts usage behavior through the mediating role of adoption intention. trialability allows users to explore the technology's potential benefits and drawbacks before full-scale adoption, thereby influencing their adoption intention [31]. This trial experience can strengthen the intention to adopt, which then translates into actual usage behavior. Hence, adoption intention serves as a mediator in the relationship between trialability and usage behavior.

H7: Blockchain adoption intention mediates the relationship between relative advantage and usage behaviour towards blockchain.

H8: Blockchain adoption intention mediates the relationship between compatibility and usage behaviour towards blockchain.

H9: Blockchain adoption intention mediates the relationship between complexity and usage behaviour towards blockchain.

H10: Blockchain adoption intention mediates the relationship between observability and usage behaviour towards blockchain.

H11: Blockchain adoption intention mediates the relationship between trialability and usage behaviour towards blockchain.

Based on the theoretical development and hypothesis development literature, we propose following research framework, presented in **Figure 1**.

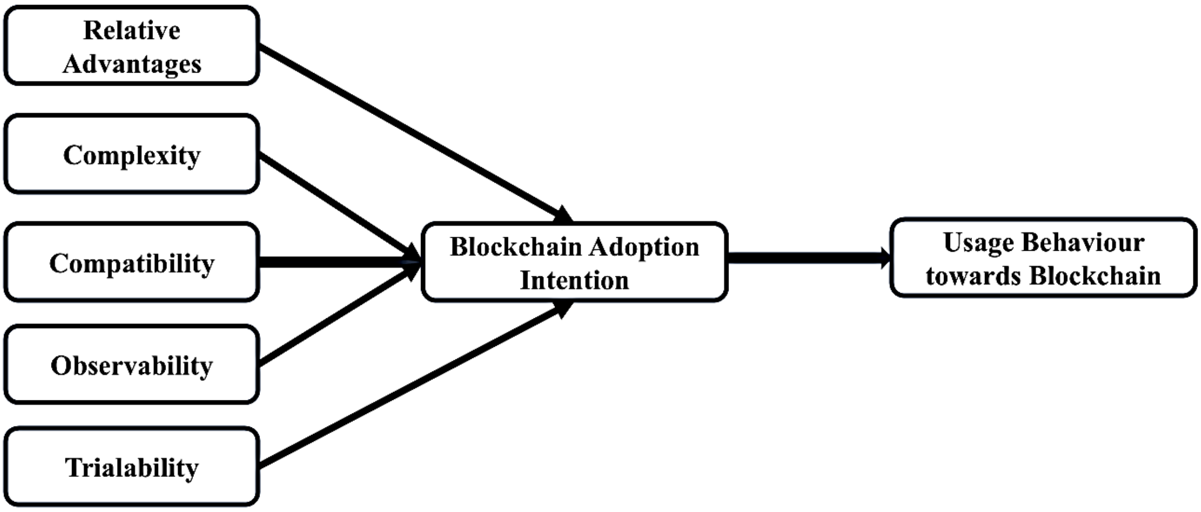

Figure 1. Conceptual Model based on the Innovation Diffusion Theory (DOI) and Technology Acceptance Model (TAM)

3. Research methodology

The study employed a descriptive research design under which a mall intercept survey was conducted to gather primary data. At a significance threshold of 0.05, the mean of the responses was statistically validated to be more than, indicating a potentially significant discovery. The respondents were chosen using a purposive sample method, which means that they were picked based on defined criteria or for a specific goal. Due to the lack of an existing scale, a self-structured questionnaire was developed for data collection and pretested by taking a small sample of 25 bank employees. A questionnaire was assessed for internal consistency by calculating Cronbach's alpha for each construct. The value of Cronbach's Alpha was greater than 0.70 for each construct without removing any item from the scale. Therefore, established the reliability of the questionnaire. This questionnaire was then sent to a large sample of approximately 400 bank employees. These employees were given time to fill out the questionnaire and send it back in a week. After one follow up 329 responses were received back. Out of 329 received responses, 79 responses were incomplete in one or other ways. Therefore, removed from the data, so finally, 250 responses were finalised to perform the statistical analysis of the perception of the adoption of blockchain technology in the private bank.

This sample of 250 was appropriately selected by using the recommendations of [32]. According to that, the minimum sample size to perform the analysis is 1:5, but 1:15 and 1:20 are preferred. This means that though a minimum of five respondents must be considered for each independent variable in the Model, 15 to 20 observations per independent variable are strongly recommended. This is in line with [33], who proposed five subjects for each independent variable as a "bare minimum requirement" for hierarchical or multiple regression analysis. Considering 28 items in the questionnaire, the selected sample of 250 respondents is appropriate to perform the analysis. The detailed data collection process is explained in Figure 1 using the PRISMA approach.

The self-structured questionnaire consists of the constructs, and their items were adopted from the previous studies to ensure the validity of the scale. Modifications in the existing scale were done to ensure the best fit in the present study context. For instance, the relative advantages construct was adopted from [6] with four items that reflected how blockchain technology helps in improving the overall efficiency of the task. All the items, along with their sources, are presented in Table 1.

Next, Exploratory Factor Analysis (EFA) was performed to explore the identical factors extracted from the data by calculating eigenvalue. Factors with more than one eigenvalue were extracted from the data. A total of seven factors were extracted from the EFA analysis, which explained 84 percent of the total variance. A few items that were showing item loading less than 0.70 were removed for further improvement of the rotated component matrix to extract the factors. For instance, BAI2, COMP5 and COMP6 were removed to improve factor loadings. Hence removed from further analysis.

Finally, A structural equation model (SEM) was utilised as the statistical test to test the hypothesis. SEM is a multivariate statistical approach that is often used to analyse correlations between variables and to evaluate complex hypotheses. It is ideal for analysing complex theoretical models since it allows for the examination of both direct and indirect effects. The SEM appears to have been employed to test the study's hypothesis.

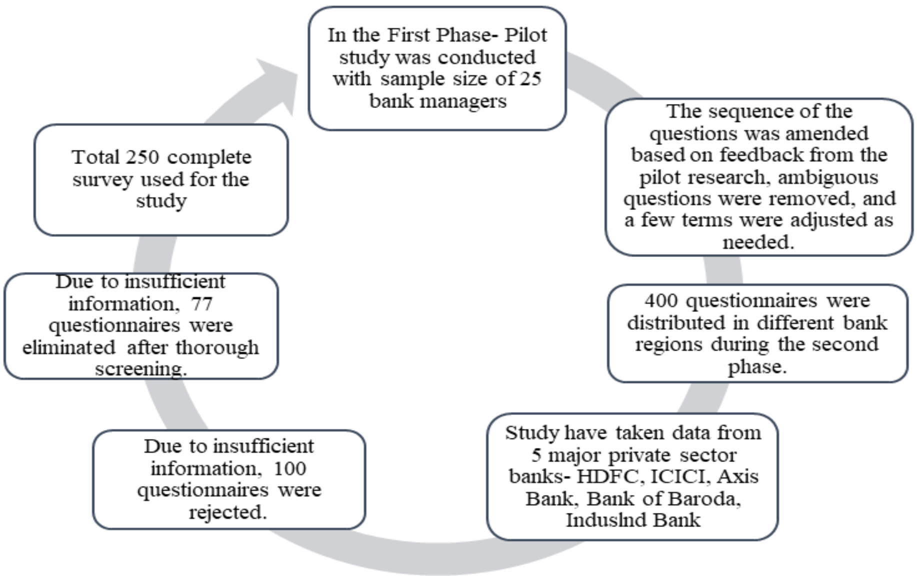

Figure 2. Data collection and inclusion process using PRISMA approach

Source: *Authors own*

4. Result and analysis

Construct reliability, average variance extracted (AVE), and discriminant validity are important concepts in statistical analysis, particularly in the context of structural equation modeling (SEM). These measures are used to assess the quality of the measurement model and the validity of the constructs being studied.

Table 1: Construct reliability, average variance extracted and discriminant validity

Construct (s)	Items	Items	Factor Loading	Cronbach's Alpha	Construct Reliability (CR)	Average Variance Extracted (AVE)
Relative Advantage (RA) [6]	RA1	Using blockchain technology improves my efficiency in completing tasks.	0.835	0.824	0.884	0.656
	RA2	Blockchain technology provides significant benefits over traditional methods.	0.728			

Construct (s)	Items	Items	Factor Loading	Cronbach's Alpha	Construct Reliability (CR)	Average Variance Extracted (AVE)
	RA3	Adopting blockchain technology enhances the quality of my work.	0.858			
	RA4	I find blockchain technology to be more advantageous than existing solutions.	0.813			
Complexity (CPX) [6]	CPX1	Blockchain technology is easy to understand.	0.832	0.902	0.932	0.774
	CPX2	Learning to use blockchain technology is straightforward.	0.908			
	CPX3	I find the processes involved in using blockchain technology complicated. (Reverse-coded)	0.919			
	CPX4	It is easy for me to become skillful at using blockchain technology.	0.856			
Compatibility (COMP) [6]	COMP1	Blockchain technology is compatible with my current work processes.	0.871	0.841	0.889	0.668
	COMP2	Using blockchain technology fits well with my existing workflows.	0.828			
	COMP3	Blockchain technology is aligned with my current technological infrastructure.	0.719			
	COMP4	Implementing blockchain technology does not require me to change my current practices.	0.844			
Observability (OBS) [19]	OBS1	I can clearly see the benefits of using blockchain technology in my industry.	0.627	0.688	0.813	0.597
	OBS2	The positive results of using blockchain technology are easily noticeable.	0.775			
	OBS3	The advantages of blockchain technology are visible to those around me.	0.892			
Trialability [19]	TRIA1	Blockchain technology is easy to understand.	0.885	0.898	0.936	0.831
	TRIA2	Learning to use blockchain technology is straightforward.	0.916			
	TRIA3	I find the processes involved in using blockchain technology complicated. (Reverse-coded)	0.932			
Usage Behaviour [13], TAM model	USG1	I regularly use blockchain technology in my daily activities.	0.773	0.88	0.913	0.726
	USG2	I am dependent on blockchain technology for my work tasks.	0.838			

Construct (s)	Items	Items	Factor Loading	Cronbach's Alpha	Construct Reliability (CR)	Average Variance Extracted (AVE)
	USG3	Blockchain technology is an integral part of my workflow.	0.897			
	USG4	I utilize blockchain technology whenever it is available.	0.893			
Blockchain adoption intention [13], TAM model	BAI1	I regularly use blockchain technology in my daily activities.	0.878	0.896	0.928	0.763
	BAI3	I am dependent on blockchain technology for my work tasks.	0.864			
	BAI4	Blockchain technology is an integral part of my workflow.	0.859			
	BAI5	I utilize blockchain technology whenever it is available.	0.892			

Source: *Authors own compilation based on the SmartPLS output*

Table 1 presents various constructs and their corresponding items used to measure blockchain technology adoption, along with their psychometric properties. The constructs include Relative Advantage (RA), Complexity (CPX), Compatibility (COMP), Observability (OBS), Trialability (TRIA), Usage Behaviour (USG), and Blockchain Adoption Intention (BAI). Each construct has several items (statements) reflecting respondents' perceptions or behaviors regarding blockchain technology. The Factor Loadings indicate the correlation between each item and its corresponding construct, with higher values (above 0.7) signifying strong associations. Cronbach's Alpha values for each construct range from 0.688 to 0.902, demonstrating acceptable to excellent internal consistency (values above 0.7 are generally considered acceptable). Construct Reliability (CR) values, ranging from 0.813 to 0.936, indicate high reliability, meaning the constructs consistently measure what they are intended to. Average Variance Extracted (AVE) values, which range from 0.597 to 0.831, show the proportion of variance captured by the constructs relative to the variance due to measurement error, with values above 0.5 considered satisfactory. The table effectively demonstrates the robustness and validity of the measurement model for studying blockchain technology adoption using established theoretical frameworks.

Table 2: Discriminant validity using Fornell-Larcker Criteria 1981

Construct	BAI	COMP	CPX	OBS	RA	TRIA	USG
BAI	**0.873**						
COMP	0.494	**0.817**					
CPX	0.329	0.412	**0.880**				
OBS	0.360	0.339	0.282	**0.772**			
RA	0.524	0.246	0.333	0.446	**0.810**		
TRIA	0.608	0.260	0.309	0.474	0.660	**0.911**	
USG	0.556	0.244	0.108	0.526	0.468	0.635	**0.852**

Source: *Authors own based on the SmartPLS output*

Discriminant validity assesses the extent to which a construct is distinct from other constructs. Using the Fornell-Larcker (1981) criterion, discriminant validity is confirmed when the square root of each construct's Average Variance Extracted (AVE) is greater than the correlations between the constructs. As presented in **Table 2**, the diagonal values represent the square root of the AVE for each construct. For example, the square root of AVE for Blockchain Adoption Intention (BAI) is 0.873, which is higher than its correlations with other constructs, such as Compatibility (COMP) (0.494) and Complexity (CPX) (0.329), indicating good discriminant validity for all constructs in the Model.

Table 3 Discriminant validity using HTMT criteria

	BAI	**COMP**	**CPX**	**OBS**	**RA**	**TRIA**	**USG**
BAI							
COMP	0.525						
CPX	0.355	0.426					
OBS	0.394	0.429	0.392				
RA	0.604	0.281	0.386	0.602			
TRIA	0.662	0.275	0.347	0.543	0.76		
USG	0.567	0.239	0.127	0.547	0.505	0.669	

Source: *Authors own based on the SmartPLS output*

Discriminant validity is also assessed using the Heterotrait-Monotrait (HTMT) criterion. In Table 3, HTMT values are below the conservative threshold of 0.85, indicating good discriminant validity. For example, the highest HTMT value is 0.76 between Relative Advantage (RA) and Trialability (TRIA), which is still below the threshold. It is suggested that each construct, such as Blockchain Adoption Intention (BAI), Complexity (CPX), Compatibility (COMP), and others, is distinct and not significantly overlapping, supporting the measurement model's validity.

Table 4 Model fit

	Saturated Model	**Estimated Model**
SRMR	0.098	0.113
d_ULS	3.383	4.504
d_G	1.599	1.728
Chi-Square	2679.516	2800.607
NFI	0.619	0.602

Source: *Authors own based on the SmartPLS output*

Model fit evaluates how well a proposed model matches the observed data. In this case (**Table 4**), the Standardized Root Mean Square Residual (SRMR), Chi-Square, d_ULS, d_G, and Normed Fit Index (NFI) values indicate moderate to poor fit, as SRMR exceeds the threshold of 0.08 and NFI is below 0.90.

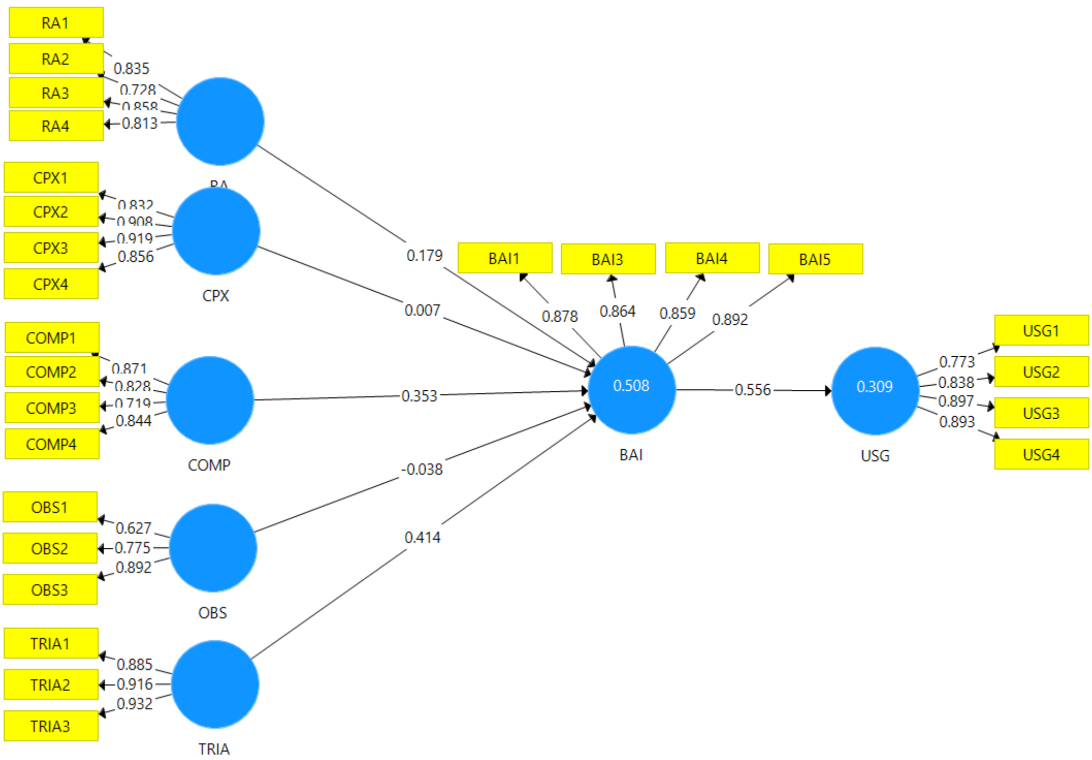

Figure 3 Measurement model

Source: *Authors own based on the SmartPLS output*

Next, the structural model fit was performed to calculate the path coefficient and hypothesis testing. It has been done by using 500 subsamples using the basic bootstrapping method at Bias bias-corrected accelerated (BCa) bootstrap confidence interval at a 5 percent significance level.

Table 5 Direct Effects Path Coefficient

Hypothesised Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
RA -> BAI	0.179	0.181	0.056	3.166	0.002
CPX -> BAI	0.007	0.006	0.036	0.187	0.851
COMP -> BAI	0.353	0.354	0.033	10.562	0.000
OBS -> BAI	-0.038	-0.037	0.043	0.884	0.377
TRIA -> BAI	0.414	0.41	0.053	7.824	0.000
BAI -> USG	0.556	0.558	0.036	15.291	0.000

Source: *Authors own based on the SmartPLS output*

Table 5 presents the results of a path analysis assessing the relationships between various constructs and blockchain adoption intention (BAI) and usage behavior (USG). The path from **Relative Advantage (RA) to BAI** is significant ($p = 0.002$), with a positive coefficient of 0.179, indicating RA positively influences BAI. **Complexity (CPX) to BAI** shows a non-significant path ($p = 0.851$), suggesting CPX does not significantly impact BAI. **Compatibility (COMP) to BAI** ($p < 0.001$) and **Trialability (TRIA) to BAI** ($p < 0.001$) are both highly significant, with strong positive effects (0.353 and 0.414, respectively). **Observability (OBS) to BAI** is non-significant (p = 0.377), indicating no effect on BAI. Finally, **BAI to Usage Behavior (USG)** is significant (p < 0.001) with a strong positive effect (0.556), suggesting that higher BAI leads to greater usage of blockchain technology.

Table 6 Specific Indirect Effects

Specific Indirect Effect	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
RA -> BAI -> USG	0.099	0.101	0.032	3.103	**0.002**
COMP -> BAI -> USG	0.196	0.197	0.021	9.167	**0.000**
TRIA -> BAI -> USG	0.231	0.23	0.038	6.057	**0.000**
OBS -> BAI -> USG	-0.021	-0.021	0.024	0.883	0.378
CPX -> BAI -> USG	0.004	0.003	0.02	0.187	0.852

Source: *Authors own based on the SmartPLS output*

The table presents specific indirect effects of various constructs on Usage Behavior (USG), mediated through Blockchain Adoption Intention (BAI). The effects of Relative Advantage (RA), Compatibility (COMP), and Trialability (TRIA) on USG are significant, with p-values less than 0.05, indicating a meaningful indirect relationship through BAI. TRIA has the strongest effect (0.231) on USG, followed by COMP (0.196) and RA (0.099). Conversely, the indirect effects of Observability (OBS) and Complexity (CPX) on USG through BAI are not significant, as indicated by their high p-values (0.378 and 0.852, respectively) and low T statistics, suggesting no meaningful mediated effect for these constructs.

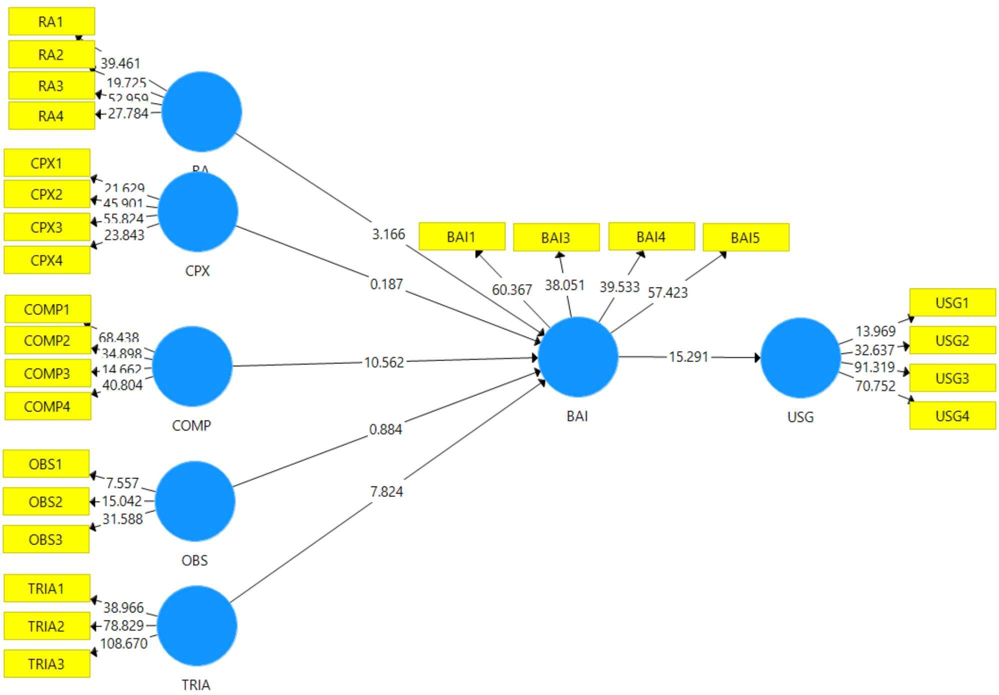

Figure 4 Structure Model with Bootstrapping Result

Source: *SmartPLS output*

5. Findings and Discussion

The findings of this study highlight the importance of various factors in the adoption of blockchain technology in private banks. The study found that Relevant advantages significantly influence the Blockchain Adoption Intention (BAI). Hence, H1 is accepted. The study highlighted the relative advantages of Blockchain technology, such as enhanced security, transparency, reduced costs, and increased efficiency, which are significant drivers that make blockchain technology attractive to private banks [34,35]. These findings are supported by [27], who advocate the potential benefits of blockchain technology in terms of improving financial transaction security and efficiency, lowering costs, and increasing transparency correspond with the demands and aims of private banks.

Furthermore, the study found no significant influence of complexity on the blockchain adoption intention (BAI). Hence, H2 is not accepted. This finding was contrary to the previous literature, which stated that the perceived complexity (CPX) of adopting and executing blockchain technology is a significant element that can impact its acceptance. So, if private banks view blockchain technology to be complex and difficult to incorporate into their existing systems and processes, they may be hesitant to adopt it [36]. However, there could be multiple reasons which oversight of the complexity issues, such as high implementation cost, scalability issues, regulatory compliance, and security issues that require immediate attention related to blockchain adoption [37]. It could be the reason why complexity is not considered a significant driver for blockchain technology adoption.

The hypothesis positing that compatibility significantly influences blockchain adoption intention (BAI) is supported by the results of the analysis. Hence, H3 is accepted. The path coefficient ($\beta = 0.353$) indicates a moderate positive relationship between compatibility and blockchain adoption intention. It is suggested that when individuals or organizations perceive blockchain technology as compatible with their existing values, needs, and experiences, they are more likely to intend to adopt it [35].

The standardized coefficient ($\beta = 0.354$) further reinforces this positive association, showing a substantial effect of compatibility on the intention to adopt blockchain technology. This coefficient indicates that for each unit increase in perceived compatibility, the intention to adopt blockchain increases by approximately 0.354 units, holding other variables constant. Moreover, the standard error (SE = 0.033) is relatively low, which points to a high precision of the estimated relationship. The t-value (10.562) is considerably higher than the critical value for conventional significance levels (e.g., 1.96 for a 95% confidence level), indicating that the relationship between compatibility and blockchain adoption intention is statistically significant. Additionally, the p-value ($p = 0.000$) is well below the common threshold of 0.05, confirming that the observed effect is not due to random chance and is statistically significant. These findings imply that the perception of compatibility plays a crucial role in the decision-making process related to blockchain adoption. When potential adopters see blockchain technology as fitting well with their current technological infrastructure, business processes, or cultural values, they are more inclined to consider its adoption. It underscores the importance for developers and promoters of blockchain technology to emphasize how blockchain can align with existing systems and practices.

Further, the result of hypothesis H4, which examines the relationship between Observability (OBS) and Blockchain Adoption Intention (BAI), shows a non-significant effect with a coefficient of -0.038 ($p = 0.377$). This lack of a significant effect suggests that simply observing blockchain technology is not enough to influence adoption intentions; more direct experience or understanding might be necessary. Whereas, non-significance might stem from other confounding factors that were not accounted for, such as varying levels of awareness or familiarity with blockchain, which could dilute the impact of observability on adoption intentions.

The results of hypothesis H5 indicate a significant positive relationship between trialability (TRIA) and blockchain adoption intention (BAI) with a coefficient of 0.414 and a p-value of 0.000. It means that the more blockchain technology can be experimented with, the higher the intention to adopt it. Further, trialability allows users to experience benefits without commitment, enhancing trust and confidence. However, it can also be noted that the adoption may still be hindered by factors like high costs, lack of regulatory clarity, and technical complexity, which are not addressed by merely providing trial experiences [38].

The results of the H6 indicate a significant positive relationship between Blockchain Adoption Intention (BAI) and the Actual Usage of Blockchain Technology (USG) in private banks ($\beta = 0.556$, $p < 0.001$). It is suggested that higher intentions to adopt blockchain correlate strongly with its actual implementation, emphasizing the critical role of managerial intent and strategic planning in the adoption process. So, when decision-makers in private banks recognize the potential benefits of blockchain, such as enhanced security, transparency, and efficiency, they are more likely to implement it. However, high adoption intentions do not always translate into usage due to factors like regulatory challenges, integration difficulties, and cost concerns. Additionally, technological complexities and the need for skilled personnel may hinder the actual usage despite strong adoption intentions. Therefore, while the intention to adopt is crucial, overcoming these barriers is essential for actual usage.

Finally, the specific indirect effects of Blockchain Adoption Intention (BAI) between RA, COMP, CPX, OBS, TRIA and Actual usage of Blockchain Technology (USG) were evaluated. The pathways involving COMP (Competitiveness) and TRIA (Trialability) exhibit significant partial mediation. Specifically, COMP ($\beta = 0.196$, $p < 0.001$) and TRIA ($\beta = 0.231$, $p < 0.001$) both show significant positive indirect effects on Actual Usage of Blockchain Technology (USG) through Blockchain Adoption Intention (BAI). While BAI significantly mediates the relationship between these variables and USG, other factors may also contribute to the direct effect of COMP and TRIA on USG (Marikyan et al., 2022). Contrary to that, OBS (Observability) and CPX (Complexity) reveal no significant mediation. OBS ($\beta = -0.021$, $p = 0.378$) and CPX ($\beta = 0.004$, $p = 0.852$) show non-significant indirect effects on USG through BAI. These values indicate that the relationship between these variables and USG is not substantially mediated by BAI, suggesting that factors like observability and complexity do not influence the adoption process significantly through intention or might have direct influences on USG.

6. Implications

The study has several implications for policymakers. For instance, to encourage the adoption of blockchain technology in the banking sector, banks need to focus on raising awareness and educating key stakeholders about its benefits. A major implication of the current scenario is that many stakeholders lack a thorough understanding of blockchain, which can lead to hesitation or resistance to adopting this technology. It is essential for banks to actively educate stakeholders on the relative benefits of blockchain, such as operational effectiveness, transparency, and security. Blockchain technology can streamline processes by reducing intermediaries, cutting costs, and saving time. Its ability to automate tasks through smart contracts can further improve efficiency and reduce human error.

Additionally, blockchain's decentralized nature ensures that all transactions are recorded transparently, which enhances trust and reduces the risk of fraud. The high level of security provided by blockchain, due to its cryptographic nature, makes it difficult for unauthorized parties to alter or manipulate data, which is particularly critical in the banking sector. To implement this strategy, banks should organize targeted educational programs, workshops, and seminars to inform stakeholders about these benefits and distribute informational materials like white papers and research reports to reinforce understanding.

Another key implication is that stakeholders might be skeptical about the practical benefits of blockchain technology, often viewing it as more theoretical than actionable. To address this, banks need to provide concrete opportunities for stakeholders to see the benefits and outcomes of blockchain technology firsthand. Hence, this can be achieved through proof-of-concept projects, which involve developing small-scale projects that demonstrate the practical application of blockchain in banking operations. These projects can showcase how blockchain can solve specific issues, such as improving the speed of cross-border transactions or enhancing compliance with regulatory requirements. Additionally, sharing detailed case studies of successful blockchain implementations by other financial institutions can highlight the challenges faced, solutions implemented, and tangible outcomes achieved, such as cost savings, improved customer satisfaction, or enhanced data security. Launching pilot projects within the bank to test blockchain technology in a controlled environment allows stakeholders to experience the technology directly, understand its impact on operations, and assess its scalability for broader adoption. To implement this, banks should collaborate with technology providers and other financial institutions to develop and share these demonstrations, inviting stakeholders to participate in pilot projects for hands-on experience.

Building confidence through increased observability is another important need for encouraging blockchain adoption. Stakeholders may be hesitant to adopt blockchain technology due to concerns about its reliability, scalability, or compatibility with existing systems. To build confidence, banks need to increase the observability of blockchain technology's effectiveness. It involves providing transparent reporting on the progress and outcomes of blockchain implementations, including performance metrics like transaction speeds, error rates, cost savings, and customer feedback, to demonstrate the real-world impact of blockchain. Establishing open communication channels, such as forums, roundtables, or digital platforms, can facilitate discussions around blockchain projects, allowing stakeholders to share experiences and raise concerns. This open communication helps address doubts and builds a community of practice around blockchain technology. Moreover, seeking endorsements or certifications from reputable industry bodies or regulators that validate the effectiveness and security of blockchain solutions can further reassure stakeholders about the reliability and safety of adopting the technology. To implement this, banks should develop a comprehensive communication strategy that includes regular updates, stakeholder engagement events, and third-party evaluations to maintain transparency and build trust among stakeholders.

By focusing on these implications and addressing the associated needs, banks can effectively promote the adoption and continuous usage of blockchain technology, fostering a more efficient, transparent, and secure banking sector.

7. Conclusion

The primary aim of this study was to explore the Innovation diffusion theory in order to test the blockchain adoption process based on underlined variables empirically. The study was performed on private bank employees in India. The study found that relative advantages significantly positively impact the blockchain adoption intention. Similarly, compatibility and trialability also positively influence the blockchain adoption intention. Therefore, the banks are required to consider these factors for the fast adoption of blockchain technology in private banks.

On the contrary, complexity and observability do not significantly impact the adoption intention towards blockchain technology. Subsequently, the adoption intention of blockchain technology significantly impacts the actual usage of blockchain technology in private banks. Adoption intention was found to be an important mediator between RA, COMP, TRIA and Actual usage of Blockchain technology. The study reported a partial mediation of BAI between RA and USG. Similarly, partial mediation was reported between COMP and USG and TRIA and USG as well. Therefore, an organization's positive intent towards blockchain technology enhances the actual usage of blockchain technology in private banks.

8. Limitations and Future Direction

Through this study, we tried to empirically investigate the factors affecting the diffusion of blockchain technology among private-sector banks. Despite the comprehensive framework and wide coverage of the scope, the study still has several implications: first, the study primarily focused on a specific set of variables, such as relative advantages, complexity, compatibility, observability, and trialability, in relation to blockchain adoption intention and its actual usage. However, the study can be further extended by using other potentially influential factors, such as regulatory challenges, cost concerns, organizational readiness, and cultural factors. Future research could benefit from examining a broader range of determinants to provide a more comprehensive understanding of blockchain adoption in private banks. Second, the study's findings are specific to private banks and may not be generalizable to other sectors or industries. The unique operational environments, regulatory requirements, and technological infrastructures of private banks could influence the adoption of blockchain technology differently compared to other settings.

Further studies could explore blockchain adoption across various industries to enhance the generalizability of the results. Third, the study utilized a cross-sectional research design, which captures a snapshot of perceptions and intentions at a single point in time. This approach limits the ability to observe changes in adoption intentions and actual usage over time, potentially missing the dynamic nature of technology adoption processes.

Lastly, Although the study provides valuable insights, the sample size and its representativeness could limit the findings. If the sample does not adequately represent the diversity within private banks, such as varying sizes, regions, or market orientations, the results may not fully capture the broader trends or variations in blockchain adoption. Increasing the sample size and ensuring a more representative sample could enhance the robustness of future findings.

Author contributions

Dr. Pooja Jain has written on Conceptualization and Design: This includes the initial idea, formulation of research goals, and development of the study design. Also worked on Data Collection and Analysis, which Involves gathering data, performing experiments, and analyzing the results to draw meaningful conclusions. Dr. Bhuvanesh Sharma performed data analysis. Dr. Ritesh has used his expertise in copyediting the document. Similarly, Dr. Pradip and Ms. Ananya both have contributed in methodology and data collection for this research.

Conflict of interest

The author declares no conflict of interest.

References

1. Wang YS, Wu SC, Lin HH, Wang YM, He TR. Determinants of user adoption of web ' "Automatic Teller Machines": an integrated model of "Transaction Cost Theory" and "Innovation Diffusion Theory." Serv Ind J [Internet] 2012 [cited 2024 Sep 7];32(9):1505–25. Available from: https://www.tandfonline.com/doi/abs/10.1080/02642069.2010.531271
2. Kawasmi Z, Gyasi EA, Dadd D. Blockchain Adoption Model for the Global Banking Industry. J Int Technol Inf Manag [Internet] 2020 [cited 2024 Sep 7];28(4):112–54. Available from: https://scholarworks.lib.csusb.edu/jitim/vol28/iss4/5
3. Jain P, Agarwal ABV-IIITM G, Pradesh India M. Factors Affecting Mobile Banking Adoption: An Empirical Study in Gwalior Region. Int J Digit Account Res 2019;19:79–101.
4. Everett M. Rogers. Diffusion of innovations. – Digital Journal [Internet]. 5th ed. 2013 [cited 2019 Feb 11]. Available from: https://kinasevych.ca/2010/03/15/rogers-2003-diffusion-of-innovations/
5. Tornatzky LG, Klein KJ. INNOVATION CHARACTERISTICS AND INNOVATION ADOPTION-IMPLEMENTATION: A META-ANALYSIS OF FINDINGS. IEEE Trans Eng Manag 1982;EM-29(1):28–45.
6. Moore GC, Benbasat I. Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation. Inf Syst Res 1991;2(3):192–222.
7. Xu J, Gan Z, Cheng Y, Liu J. Discourse-Aware Neural Extractive Text Summarization. Proc Annu Meet Assoc Comput Linguist [Internet] 2020 [cited 2024 Sep 8];5021–31. Available from: https://aclanthology.org/2020.acl-main.451
8. Venkatesh V, Morris MG, Davis GB, Davis FD. User acceptance of information technology: Toward a unified view. MIS Q Manag Inf Syst 2003;27(3):425–78.
9. Wang T, Jin H, Fan Y, Obembe O, Li D. Farmers' adoption and perceived benefits of diversified crop rotations in the margins of U.S. Corn Belt. J Environ Manage 2021;293:112903.
10. Schuetz S, Venkatesh V. Blockchain, adoption, and financial inclusion in India: Research opportunities. undefined 2020;52.
11. Martino P. Blockchain and Banking: How Technological Innovations Are Shaping the Banking Industry. Blockchain Bank How Technol Innov Are Shap Bank Ind 2021;1–109.
12. Saheb T, Mamaghani FH. Exploring the barriers and organizational values of blockchain adoption in the banking industry. J High Technol Manag Res 2021;32(2):100417.
13. Davis FD. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Q [Internet] 1989 [cited 2018 Sep 30];13(3):319. Available from: https://www.jstor.org/stable/249008?origin=crossref
14. Venkatesh V, Bala H. Technology Acceptance Model 3 and a Research Agenda on Interventions. Decis Sci [Internet] 2008 [cited 2024 Sep 7];39(2):273–315. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1540-5915.2008.00192.x
15. Queiroz MM, Fosso Wamba S. Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. Int J Inf Manage 2019;46:70–82.
16. Hameed MA, Arachchilage NAG. The role of self-efficacy on the adoption of information systems security innovations: a meta-analysis assessment. Pers Ubiquitous Comput [Internet] 2021 [cited 2024 Sep 7];25(5):911–25. Available from: https://link.springer.com/article/10.1007/s00779-021-01560-1
17. Khatri T. UNDERSTANDING ADOPTION FACTORS OF SUBSCRIPTION BASED ENTERTAINMENT SERVICES AMONG CONSUMERS IN INDIA. Inf Technol Ind [Internet] 2021 [cited 2024 Sep 7];9(1):795–809. Available from: http://www.it-in-industry.org/index.php/itii/article/view/200
18. Khatri A, Kaushik A. SYSTEMATIC LITERATURE REVIEW ON BLOCKCHAIN ADOPTION IN BANKING. J Econ Financ Accounting-JEFA [Internet] 2021 [cited 2024 Sep 7];8(3):126–45. Available from: http://doi.org/10.17261/Pressacademia.2021.1458
19. Rogers EM. Diffusion of Innovations, 5th Edition (Google eBook). 2003 [cited 2021 Aug 1];576. Available from: https://books.google.com/books/about/Diffusion_of_Innovations_5th_Edition.html?id=9U1K5LjUOwEC
20. Kapoor KK, Dwivedi YK, Williams MD. Innovation adoption attributes: A review and synthesis of research findings. Eur J Innov Manag 2014;17(3):327–48.
21. Chou CM, Shen TC, Shen TC, Shen CH. Teachers' adoption of AI-supported teaching behavior and its influencing factors: using structural equation modeling. J Comput Educ [Internet] 2024 [cited 2024 Sep 8];1–44. Available from: https://link.springer.com/article/10.1007/s40692-024-00332-z
22. Premkumar G, Roberts M. Adoption of new information technologies in rural small businesses. Omega 1999;27(4):467–84.
23. Fosso Wamba S, Queiroz MM, Trinchera L. Dynamics between blockchain adoption determinants and supply chain performance: An empirical investigation. Int J Prod Econ 2020;229:107791.
24. Schuetz S, Venkatesh V. Blockchain, adoption, and financial inclusion in India: Research opportunities. Int J Inf Manage 2020;52:101936.

25. Karahanna E, Straub DW, Chervany NL. Information technology adoption across time. MIS Q [Internet] 1999 [cited 2024 Sep 7];23(2):183–213. Available from: https://dl.acm.org/doi/10.2307/249751
26. Choi D, Chung CY, Seyha T, Young J. Factors Affecting Organizations' Resistance to the Adoption of Blockchain Technology in Supply Networks. Sustain 2020, Vol 12, Page 8882 [Internet] 2020 [cited 2024 Sep 7];12(21):8882. Available from: https://www.mdpi.com/2071-1050/12/21/8882/htm
27. Khalil MM, Ahmed W. Analyzing the drivers of blockchain adoption for supply chain in Pakistan. J Sci Technol Policy Manag 2024;ahead-of-print(ahead-of-print).
28. Tan M, Teo TSH. Factors Influencing the Adoption of Internet Banking. J Assoc Inf Syst 2000;1.
29. Agarwal R, Prasad J. The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies. Decis Sci [Internet] 1997 [cited 2024 Sep 7];28(3):557–82. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1540-5915.1997.tb01322.x
30. Pappas I, Kourouthanassis PE, Mikalef P, Giannakos M. Combining system success factors with trust to explain e-government adoption using fsQCA. Am Conf Inf Syst 2018;
31. Morkunas VJ, Paschen J, Boon E. How blockchain technologies impact your business model. Bus Horiz 2019;62(3):295–306.
32. Hair JF, Sarstedt M, Ringle CM, Gudergan SP. Advanced Issues in Partial Least Squares Structural Equation Modeling [Internet]. Sage Publication Inc.; 2018 [cited 2022 May 26]. Available from: https://books.google.co.in/books?hl=en&lr=&id=-f1rDgAAQBAJ&oi=fnd&pg=PP1&ots=vY00klG1a_&sig=5HGkM7WH4jsNUth__LxKc1FZS50&redir_esc=y#v=onepage&q&f=false
33. Tabachnick BG, Fidell LS. Using Multivariate Statistics Title: Using multivariate statistics. 2019 [cited 2024 Sep 8];Available from: https://lccn.loc.gov/2017040173
34. Wong LW, Leong LY, Hew JJ, Tan GWH, Ooi KB. Time to seize the digital evolution: Adoption of blockchain in operations and supply chain management among Malaysian SMEs. Int J Inf Manage 2020;52:101997.
35. Jena RK. Examining the Factors Affecting the Adoption of Blockchain Technology in the Banking Sector: An Extended UTAUT Model. Int J Financ Stud [Internet] 2022 [cited 2024 Sep 8];10(4):90. Available from: https://www.mdpi.com/2227-7072/10/4/90/htm
36. Ullah N, Al-Rahmi WM, Alfarraj O, Alalwan N, Alzahrani AI, Ramayah T, et al. Hybridizing cost saving with trust for blockchain technology adoption by financial institutions. Telemat Informatics Reports 2022;6:100008.
37. Marikyan D, Papagiannidis S, Rana OF, Ranjan R. Blockchain adoption: A study of cognitive factors underpinning decision making. Comput Human Behav 2022;131.
38. Kumari A, Devi NC. Determinants of user's behavioural intention to use blockchain technology in the digital banking services. Int J Electron Financ 2022;11(2):159–74.