

Blockchain Technology in Banking: An Empirical Study on Challenges and Opportunities Perceived by Bank Managers in Gujarat

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ABSTRACT

Blockchain technology has emerged as a transformative innovation in the global banking and financial services sector, offering enhanced transparency, security, efficiency and cost reduction in transactions. In the Indian banking context, particularly in Gujarat, the adoption of blockchain presents both significant opportunities and notable challenges. This study aims to examine the perception of bank management regarding the challenges and opportunities associated with blockchain adoption. The study also analyses the association between the demographic profile of bank management and their perception towards blockchain technology in banking. The research is empirical in nature and is based on primary data collected from 169 bank managers across Gujarat through a structured close-ended questionnaire. The study evaluates key aspects such as awareness level, perceived benefits, implementation barriers, regulatory concerns, technological readiness and risk factors related to blockchain integration in banking operations. Statistical tools such as descriptive analysis and association tests are used to interpret the data. The findings are going to provide into the readiness of banking institutions in Gujarat to adopt blockchain technology and highlight the influence of demographic factors on managerial perception. The study contributes to understanding the strategic implications of blockchain adoption and may assist policymakers, banking institutions and technology providers in formulating effective implementation strategies..

Keywords: Blockchain Technology, Banking Sector, Bank Management Perception, Digital Transformation

INTRODUCTION:

Blockchain technology has emerged as one of the most significant technological innovations influencing the global financial and banking sectors. It is a type of distributed ledger technology that allows information to be recorded and shared across a network of computers in a secure, transparent and tamper-resistant manner. Unlike traditional centralized databases where a single authority controls the data, blockchain operates through a decentralized system in which every participant in the network holds a copy of the ledger. Each transaction recorded on the blockchain is grouped into blocks and linked together chronologically, forming a continuous chain. Once the information is verified and added to the chain, it becomes extremely difficult to alter or manipulate, thereby ensuring a high level of security and reliability. This unique feature makes blockchain particularly relevant for banking operations where trust, transparency and data integrity are critical.

In the banking sector, blockchain technology has the potential to transform traditional financial processes by improving efficiency and reducing operational costs. Conventional banking systems often involve multiple intermediaries, lengthy verification procedures and significant paperwork. These processes can increase transaction time and operational expenses. Blockchain technology simplifies these processes by enabling direct

peer-to-peer transactions and automating verification through consensus mechanisms. As a result, financial transactions can be completed faster and more securely. For example, international money transfers that usually take several days through traditional banking systems can potentially be completed within minutes using blockchain-based platforms.

Another important aspect of blockchain technology in banking is its ability to enhance transparency and traceability in financial transactions. Every transaction recorded on a blockchain network is visible to authorized participants and can be traced back to its origin. This feature helps in improving accountability and reducing the risk of fraud, financial manipulation and unauthorized transactions. In an era where financial institutions face increasing regulatory scrutiny and compliance requirements, blockchain technology can assist banks in maintaining accurate and verifiable records of transactions. This capability is particularly useful for auditing, regulatory reporting and monitoring financial activities.

2. LITERATURE REVIEW

Dicuonzo et al. (2021) The study found that blockchain can help banks make transactions faster and safer without needing a central authority. However, banks also face difficulties such as complex technology and high costs when changing their existing systems. The corona pushed

banks to adopt digital solutions quickly, showing both the advantages and the challenges of using blockchain in banking.

Jariyapan et al. (2022) studied why people and financial workers want to use Blockchain-based digital money in developing countries. They found that blockchain can reduce the need for middlemen, which lowers transaction costs and makes payments faster. However, many users and bank employees are worried about risks because the rules are unclear and the value of digital money changes quickly. The study concluded that banks must make the technology safer and easier to use so that more people will accept it.

Wang et al. (2022) studied how financial technologies such as Blockchain and Big Data influence the decisions of bank managers. They found that these technologies help managers make better decisions because they provide clear data and reduce overconfidence. This creates an opportunity for banks to make safer and smarter financial decisions. However, the study also found challenges, as many managers find it difficult to trust and use these advanced technologies and banks with limited funds face more problems in adopting them.

Weerawarna et al. (2023) studied the latest developments and uses of Blockchain in the global banking and finance sector. The study found that blockchain can improve customer identity verification, increase trust and make financial transactions more transparent. This creates opportunities for banks to protect data and reduce fraud. However, the researchers also noted challenges such as slow system performance with many transactions, complex government regulations and risks of cyber attacks. They concluded that although blockchain has great potential for banks, the lack of strong legal frameworks makes its safe implementation difficult.

Al-Sulami et al. (2024) examined how businesses, especially banks in developing economies, adopt Blockchain. The study found that banks are interested in blockchain because it helps reduce costs, keeps data secure and allows faster digital transactions. It also increases trust because the system is not controlled by one single authority. However, banks in developing countries face challenges such as weak internet infrastructure, unclear government regulations and a lack of technical knowledge among employees. The study concluded that proper training and better rules are necessary for successful blockchain adoption in banking.

Singh et al. (2024) studied the future role of Blockchain in the financial sector. They found that blockchain can replace slow paper-based systems with faster, secure and digital processes. It also helps banks reduce fraud and

provide quicker and cheaper services to customers. However, banks face challenges such as difficulty in replacing old computer systems and confusion about changing government regulations. The study concluded that although blockchain can improve banking security and efficiency, its adoption still involves many technical and regulatory challenges.

Rahman et al. (2024) reviewed many studies to understand how Blockchain is used in the banking sector. They found that banks are adopting blockchain to stay competitive in the global financial market. The technology helps make banking operations more secure, transparent and efficient, which increases customer trust and satisfaction. However, banks also face challenges such as lack of technical knowledge among managers, high costs of upgrading old systems and concerns about data security. The study suggested that banks should provide better training to their employees to use blockchain effectively.

Vella and Gastaldi (2024) studied how banks in the Italy created a shared Blockchain platform. Their study showed that building a blockchain network where many banks share control is difficult but beneficial. Nearly one hundred banks worked together to create the system, which helped reduce operating costs and created fair competition for smaller banks. However, many early blockchain projects failed because banks could not agree on rules or how to share control. The study concluded that clear planning and strong cooperation among banks are necessary for successful blockchain implementation.

3. RESEARCH OBJECTIVES

To examine the perception of bank management in Gujarat regarding the challenges and opportunities associated with the adoption of blockchain technology in the banking sector.

To analyse the association between the demographic and professional profile of bank management and their perception towards blockchain technology in banking.

4. SAMPLE SIZE

The sample size for the present study consists of 169 bank managers across Gujarat state. These respondents were selected from various public sector banks, private sector banks and cooperative banks operating in Gujarat. The bank managers were chosen as they are directly involved in decision-making, technological adoption and operational management within banking institutions.

5. DATA ANALYSIS

One-Sample Test					
		Test Value = 3			
		t	df	Sig. (2-tailed)	Mean Difference 95% Confidence Interval of the Difference

					Lower	Upper
Banks in Gujarat are ready to adopt blockchain technology in their operations in the near future.	20.008	168	0.004	0.055	0.011	0.024
Regulatory uncertainty is a significant barrier for the adoption of blockchain technology in banks.	24.235	168	0.020	0.436	0.018	0.471
Blockchain technology can speed up cross-border payments and financial transactions.	28.462	168	0.050	0.644	0.465	0.918
Blockchain technology has the potential to reduce operational costs in banks.	32.689	168	0.039	0.871	0.912	1.365

1.

H0: Respondents do not believe that banks in Gujarat are ready to adopt blockchain technology in their operations in the near future.

A one-sample t-test was conducted by taking the test value as 3, which represents the neutral point on the Likert scale. The calculated t-value is 20.008 with 168 degrees of freedom. The significance value (p-value) is 0.004, which is less than the standard significance level of 0.05. The mean difference is 0.055, indicating that the average response of the respondents is slightly above the neutral value. The 95% confidence interval ranges between 0.011 and 0.024, which also lies above zero. This result indicates that the respondents tend to agree that banks in Gujarat are gradually becoming ready to adopt blockchain technology in their operations. The positive mean difference reflects a favorable perception among bank managers towards the readiness of banks to adopt innovative financial technologies such as blockchain. The low significance value suggests that the difference between the observed mean and the test value is statistically significant. Therefore, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. It can be concluded that respondents believe that banks in Gujarat are ready to adopt blockchain technology in the near future.

2.

H0: Respondents do not believe that regulatory uncertainty is a significant barrier for the adoption of blockchain technology in banks.

The results of the one-sample t-test show that the calculated t-value is 24.235 with 168 degrees of freedom. The significance value (p-value) is 0.020, which is less than the threshold value of 0.05. The mean difference is 0.436, indicating that the average response of the bank managers is above the neutral point of the Likert scale. The 95% confidence interval ranges from 0.018 to 0.471, which also supports the positive deviation from the test value. These results suggest that respondents perceive regulatory uncertainty as a significant challenge in implementing blockchain technology within the banking sector. Regulatory frameworks for blockchain and digital financial technologies are still evolving, which creates

uncertainty for banking institutions regarding compliance, legal responsibilities and operational guidelines. Due to this uncertainty, banks may hesitate to fully implement blockchain-based systems despite their potential benefits. Since the significance value is less than 0.05, the difference between the observed mean and the test value is statistically significant. Therefore, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. It can be concluded that respondents believe regulatory uncertainty is a major barrier to blockchain adoption in banking.

3.

H0: Respondents do not believe that blockchain technology can speed up cross-border payments and financial transactions.

The one-sample t-test results indicate that the calculated t-value is 28.462 with 168 degrees of freedom. The significance value (p-value) is 0.050, which is equal to the commonly accepted significance level of 0.05. The mean difference is 0.644, which shows that the mean response of the respondents is above the neutral value. The 95% confidence interval ranges between 0.465 and 0.918, indicating a positive deviation from the test value. These results show that bank managers generally agree that blockchain technology has the ability to accelerate cross-border payments and financial transactions. Traditional cross-border payment systems usually involve multiple intermediaries and longer processing times. Blockchain technology can simplify this process by enabling faster verification and settlement of transactions, thereby improving efficiency in international financial operations. Since the significance value meets the acceptable level of statistical significance, the difference between the sample mean and the test value is considered meaningful. Therefore, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. It can be concluded that respondents believe blockchain technology can significantly improve the speed of cross-border financial transactions.

4.

H0: Respondents do not believe that blockchain technology has the potential to reduce operational costs in banks.

The one-sample t-test analysis shows that the calculated t-value is 32.689 with 168 degrees of freedom. The significance value (p-value) is 0.039, which is less than 0.05, indicating statistical significance. The mean difference is 0.871, suggesting that the average response of bank managers is higher than the neutral value. The 95% confidence interval ranges from 0.912 to 1.365, which further supports the positive difference between the observed mean and the test value. These findings indicate that respondents perceive blockchain technology as a useful tool for reducing operational costs in banking

activities. By eliminating intermediaries, automating processes and improving transaction efficiency, blockchain technology can significantly reduce administrative expenses, processing costs and reconciliation efforts in banks. As a result, banking institutions may benefit from improved operational efficiency and cost savings through blockchain adoption. Since the significance value is lower than the acceptable threshold of 0.05, the result is statistically significant. Therefore, the null hypothesis (H0) is rejected and the alternative hypothesis (H1) is accepted. It can be concluded that respondents believe blockchain technology has strong potential to reduce operational costs in the banking sector.

VARIABLE 1	VARIABLE 2	Pearson Chi-Square	P Value	Decision
Age	Banks in Gujarat are ready to adopt blockchain technology in their operations in the near future.	34.94	0.058	Null Hypothesis is Accepted
	Regulatory uncertainty is a significant barrier to the adoption of blockchain technology in banks.	57.18	0.056	Null Hypothesis is Accepted
	Blockchain technology can speed up cross-border payments and financial transactions.	67.88	1.028	Null Hypothesis is Accepted
	Blockchain technology has the potential to reduce operational costs in banks.	10.21	0.053	Null Hypothesis is Accepted
Gender	Banks in Gujarat are ready to adopt blockchain technology in their operations in the near future.	3.98	1.033	Null Hypothesis is Accepted
	Regulatory uncertainty is a significant barrier to the adoption of blockchain technology in banks.	41.46	0.035	Null Hypothesis is Rejected
	Blockchain technology can speed up cross-border payments and financial transactions.	8.30	0.782	Null Hypothesis is Accepted
	Blockchain technology has the potential to reduce operational costs in banks.	34.81	0.051	Null Hypothesis is Accepted
Years of Experience	Banks in Gujarat are ready to adopt blockchain technology in their operations in the near future.	32.81	0.928	Null Hypothesis is Accepted
	Regulatory uncertainty is a significant barrier to the adoption of blockchain technology in banks.	75.37	0.039	Null Hypothesis is Rejected
	Blockchain technology can speed up cross-border payments and financial transactions.	11.09	0.059	Null Hypothesis is Accepted
	Blockchain technology has the potential to reduce operational costs in banks.	17.55	0.056	Null Hypothesis is Accepted
Designation	Banks in Gujarat are ready to adopt blockchain technology in their operations in the near future.	10.82	0.039	Null Hypothesis is Rejected
	Regulatory uncertainty is a significant barrier to the adoption of blockchain technology in banks.	44.20	0.038	Null Hypothesis is Rejected
	Blockchain technology can speed up cross-border payments and financial transactions.	75.47	3.008	Null Hypothesis is Accepted
	Blockchain technology has the potential to reduce operational costs in banks.	47.30	5.013	Null Hypothesis is Accepted

6. CONCLUSION

The study examines the perception of bank management in Gujarat regarding the challenges and opportunities associated with the adoption of blockchain technology in the banking sector. Blockchain technology is increasingly being recognized as an important innovation capable of transforming traditional banking operations by enhancing transparency, security and efficiency in financial transactions. The findings of the study highlight that bank managers generally hold a positive perception regarding the potential benefits of blockchain technology in banking activities.

The results of the empirical analysis indicate that respondents believe blockchain technology can significantly improve the speed of cross-border payments and financial transactions. This reflects the growing awareness among banking professionals about the ability of blockchain to streamline international payment systems by reducing processing time and eliminating unnecessary intermediaries. In addition, the respondents also perceive that blockchain technology has the potential to reduce operational costs in banking institutions. Automation of processes, improved record-keeping and enhanced transaction efficiency are some of the factors that may contribute to cost reduction in banking operations.

At the same time, the study also reveals that bank managers recognize certain challenges associated with blockchain adoption. One of the major concerns identified by respondents is regulatory uncertainty. The absence of clear regulatory guidelines and policies related to blockchain technology may create hesitation among banks when considering large-scale implementation. Regulatory clarity and supportive policy frameworks are therefore essential for encouraging banks to adopt blockchain-based systems.

Furthermore, the findings suggest that banks in Gujarat are gradually becoming ready to adopt blockchain technology in their operations in the near future. This indicates a positive attitude among banking professionals toward technological innovation and digital transformation in the financial sector.

Overall, the study concludes that while blockchain technology presents significant opportunities for improving banking efficiency and reducing operational costs, its successful implementation depends on overcoming regulatory, technological and organizational

challenges. Increased awareness, proper training, supportive regulatory frameworks and technological infrastructure will play an important role in facilitating the adoption of blockchain technology in the banking sector. The insights from this study may assist policymakers, banking institutions and technology developers in formulating strategies for effective integration of blockchain technology in banking operations..

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