

Assessing Key Enablers for Blockchain Adoption in Banking in India: An ISM and MICMAC Analysis

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Abstract

Purpose: The purpose of the study is to assess the key factors influencing blockchain adoption in banking and analyze their interrelationships. Its objective is to bridge the gap by identifying the most critical enablers and dependencies, and providing insights into how blockchain can be effectively integrated into banking operations.

Design/Methodology/Approach: The study uses a mix of methods, combining qualitative and quantitative data. Interviews with experts and group discussions determine key factors while surveys measure how essential these factors are. By using ISM and MICMAC, the study helps to establish a structured hierarchy of factors influencing blockchain adoption.

Findings: The study identifies regulatory environment, economic viability, and technology readiness as key drivers of blockchain adoption. Customer demand and organizational readiness support adoption, while competition is an outcome of successful implementation. Regulatory support and financial sustainability are crucial for accelerating integration.

Research Limitations/Implications: This study focuses on India specifically, so its findings may not apply universally to other places.

Keywords: Blockchain, Banking, Financial Institutions, India, Interpretive Structural Modeling, MICMAC

1. Introduction

Blockchain technology works as a decentralized system spread out over several computers, recording transactions securely and transparently using cryptographic methods. Each block in the chain stores a series of transactions and is linked cryptographically to the one before it, safeguarding it against tampering and making it unchangeable (Poongodi et al., 2022; Shah and Parveen, 2021). The structure of the blockchain is such that it makes it impossible to make changes to the previous records. This is because the blockchain comprises cryptographically linked blocks (Polara et al., 2022). The first application of blockchain technology was Bitcoin which was introduced in 2009. This was mainly used for cryptocurrency transactions (Kingslin and Zahra, 2019; Venkatesan and Rahayu, 2024). Blockchain technology has certain important features. It is decentralized which removes the need of central authority allowing peer-to-peer transactions (Poongodi et al., 2022; Shah and Parveen, 2021). It ensures data integrity as when the data is logged in the blockchain it cannot be manipulated (Polara et al., 2022). It is transparent as all members in the network have access to the same data ensuring trust and accountability (Shah and Parveen, 2021). Blockchain prevents fraud and cyber-attacks as it uses cryptographic techniques to ensure safety of the data (Shah and Parveen, 2021; Polara et al., 2022). Blockchain has found numerous applications. Apart from cryptocurrencies with Bitcoin being the first example (Kingslin

and Zahra, 2019), smart contracts are extensively used in many industries (Polara et al., 2022). It is also used in supply chain management where it increases transparency and traceability that in turn improves efficiency and reduces fraud (Medhi, 2021; Zhang et al., 2023). In the finance sector, it makes more efficient payment systems, improves security and decreases the need for intermediaries (Sharma et al., 2023; Govindan et al., 2023).

Banks are currently studying the usage of blockchain technology for a variety of reasons. Blockchain technology provides many advantages to banks such as increased efficiency, enhanced security, decreased costs, better compliance and also opening up new streams for revenue. It is worth mentioning that blockchain is a new and progressive technology and it is not yet very evident which specific cases of use will prove to be most valuable for banks. Banks are required to keep track of the development of blockchain technology and explore ways to find the best means to integrate it with their operations. This paper aims at identifying enablers for blockchain adoption in banking in India and seeks to understand inter-relationships among these enablers (factors). To rank these enablers, questions were asked to the experts in blockchain adoption in banking in India. On these identified enablers, interpretive structural modelling (ISM) followed by MICMAC analysis were performed to present a model and the appropriate associations among these enablers. Hence, this study addresses the following research questions:

- To rank the key enablers for blockchain adoption in banking in India.
- To construct a structural model based on interpretive structural modeling
- To classify the identified enablers into four clusters, namely autonomous, dependent, linkage, and independent grounded on their dependence and driving powers.

The suggested model intends to help management decide the essential variables to be focused upon to for the blockchain adoption in banking in India.

The article is ordered as follows: Section 1 gives an introduction about the topic followed by literature review in section 2. Section 3 provides research methodology. Section 4 describes analysis, results and findings. Lastly, the conclusion is presented in section 5.

2. Literature Review

There have been numerous studies on the potential effect of blockchain on the banking industry. The adoption of blockchain technology in the banking industry could potentially result in high-cost savings per year. This is due to the reduced need for intermediaries and the ability to automate and streamline processes, such as payment and settlement. Another study examined the potential impact of blockchain on cross-border payments and found that it could greatly reduce the time and cost of such transactions. Currently, cross-border payments often involve multiple intermediaries and can take several days to complete, resulting in high fees for customers.

Blockchain technology has the power to change the banking industry in India. It can make things more transparent, secure, and efficient. For Indian banks to effectively use blockchain technology, they must have a good understanding of the technical aspects and enough resources. Companies need to spend on research and development to come up with practical applications and be ready to work together (Agarwal et al., 2021). Bankers are keen on using blockchain technology because certain factors like making things easier, expected performance, and having trust from the start play a big role. These factors help predict how likely it is for bankers to adopt and use blockchain for their transactions (Jena, 2022). When it comes to adopting blockchain, organization's

resources, like IT and finances, and outside pressures from clients and competition play a big role. These factors are super important, even more so than just the tech side of things (Kajla et al., 2024). Competitive pressure (Kulkarni and Patil, 2020) and relative advantage is an important enabler for blockchain adoption in banking (Kajla, 2024). To make good use of blockchain technology, it's important to have strong rules and teamwork across different industries. These guidelines can help reduce fraud, make things run smoother, and make transactions easier (Pangarkar and Majra, 2024). Organizational dimension is an important factor for the blockchain adoption in banking (Kajla, 2024). How ready an organization is, with its management backing and preparedness for change, can affect how well it adopts blockchain technology. Organizational readiness are the enablers at the organizational level such as leadership, strategy, competency and training of people (Hirst et al., 2024). Other factors, like competition and government support, also influence how much people adopt things. With more people getting comfortable using smartphones and the internet, the need for modern digital banking services has increased. This includes technologies like blockchain (Surekha et al., 2022; Sille et al., 2024). Banks are turning to blockchain technology to meet customers' growing needs for secure, transparent, and efficient banking services. The rise of online banking has created a desire for quick payments and better transparency, both of which blockchain can deliver (Sharma et al., 2023). By bringing in transparency and efficiency in banking transactions, blockchain technology improves the attitudes of the customers (Jayaraman et al., 2023). Adoption of blockchain technology also improves efficiency of the business processes which are valued by the customers (Bruno and Iacoviello, 2022). It has a positive impact on customer service quality and experience which can lead to demand for blockchain based services (Jayaraman et al., 2023).

There are also certain challenges in the blockchain technology adoption. Banks encounter technology related challenges like dealing with the complicated nature of blockchain systems and operational issues when trying to blend blockchain into their current banking processes. Regulatory hurdles and environmental conditions, such as competition and client demand, are key factors in how you adopt new practices. It's crucial to meet regulations and adjust to environmental factors to succeed (Khanna and Haldar, 2023). Government support is one of the crucial factors for blockchain in banking (Dhingra and Gupta, 2024). Regulation is a critical factor of blockchain technology (Mishra et al., 2023). Blockchain technology provides opportunities as it can really boost security and make things run smoother by cutting costs and ensuring a safe space for you as a customer (Thaman, 2022). The blend of blockchain technology with the Internet of Things opens up new possibilities in banking. It can lead to peer-to-peer lending, updating Know Your Customer information, making cross-border payments smoother, and reducing fraud (Surekha et al., 2022).

By focusing on these factors, banking in India can harness the potential of blockchain to improve service delivery, enhance decision-making, and ultimately achieve better outcomes for the customers. Accordingly, to bridge the gap, the study aims to identify the prime factors influencing adoption of blockchain in banking and analyze their relationships.

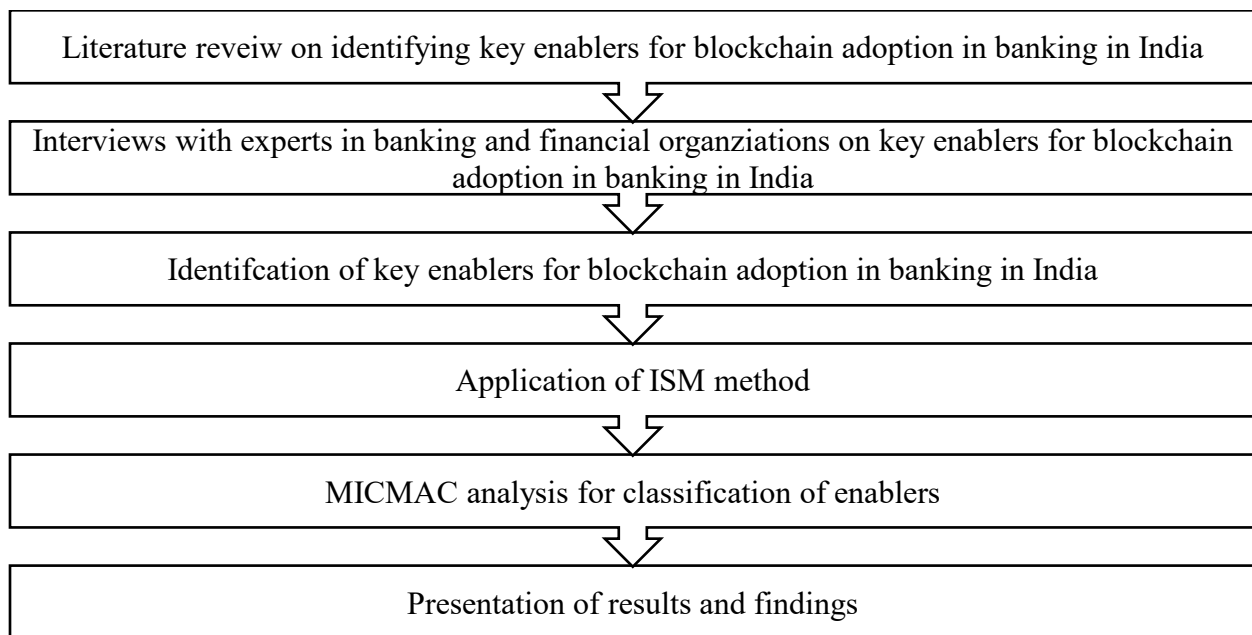
3. Methodology

The research methodology adopted is a mix of qualitative primary and secondary research. The primary research involves in-depth interviews with experts working in financial institutions, banks and blockchain companies. The questions were asked pertaining to the current usage of blockchain technology in the banking industry, including the types of applications being used and the benefits

and challenges experienced by banks. The questions were open ended and revolved around their understanding of implementation of blockchain technology in the banking industry.

To study aims to identify the key factors that influence the adoption of blockchain technology in banking and examine their interlinkages. Using Interpretative Structural Modelling (ISM) and MICMAC analysis, the causal relationships and interdependence between these different factors and their level of influence and dependence on one another is studied. ISM and MICMAC methods have been adopted by various studies and have gained popularity over time (Agarwal et al., 2023). The secondary research involves reviewing literature revolving around studies which focus on the application of blockchain technology in the banking sector. Figure 1 presents the procedure followed for the study.

Figure 1: Research Methodology



Identification of enablers for blockchain adoption in banking in India

The factors identified through literature review and expert opinions for effective blockchain adoption in banking in India are as follows: ‘Technological Readiness’, ‘Organizational Readiness’, ‘Regulatory Environment’, ‘Competitive Pressure’, ‘Customer Demand’, and ‘Economic Viability’. The explanation of the identified factors and their description is as presented in table 1.

Table 1: Description of the selected enablers

S. No.	Enabler	Description	Reference
1	Technological Readiness	This factor refers to the availability and development of blockchain technology infrastructure and solutions. It is a necessary condition for the effective implementation of blockchain in the banking sector.	Kulkarni and Patil (2020); Agarwal et al., (2021); Al-Okaily (2025)

2	Organizational Readiness	This factor refers to the readiness of the bank to adopt, implement, and integrate blockchain technology into its operations. The internal resources, processes, and culture of bank will impact the success of its blockchain adoption.	Hirst et al. (2024); Al-Okaily (2025)
3	Regulatory Environment	This factor refers to the regulatory support and clear rules around the usage of blockchain technology in banking are required by the banks, which is important for its successful implementation.	Kulkarni and Patil (2020); Sharma et al. (2023)
4	Competitive Pressure	This factor refers to the force led by other banks and financial institutions who are adopting blockchain technology.	Kulkarni and Patil (2020)
5	Customer Demand	This refers to the force exerted by the customers to adopt blockchain technology which influences banks and financial institutions to adopt the same. Blockchain technology brings in security which builds customers' trust. Its applications also enhance customer service quality.	Bruno and Iacoviello (2022); Jayaraman et al. (2023)
6	Economic Viability	The financial or economic feasibility of blockchain plays an important role in its adoption by banks and financial institutions. The associated cost and expenses of blockchain should outweigh cost-effectiveness and efficiency benefits.	Thaman (2022); Cucculelli and Recanatini (2022); Ramirez et al. (2022); Obaid et al., (2023)

4. Analysis, Results and Findings

In this study, the factors identified have been analysed using ISM and MICMAC analysis methods. ISM method used graph theory to break down complex systems into manageable parts, drawing on experts' knowledge and experiences. It is an interpretive method, as the experts chosen for the study decide whether and how the factors are connected (Ravi and Shankar, 2005). It was first introduced by Warfield in 1974 and is used to identify inter-relationships and dependencies between factors. It provides a way by which sequence or order can be insisted on the complexity of such factors (Mandal and Deshmukh, 1994). In recent years, the ISM method has gained much popularity in the area of management research (Mandal and Deshmukh, 1994; Ravi and Shankar, 2005). MICMAC stands for *Matrice d'impacts croises-multiplication applique' an classment* (cross-impact matrix multiplication applied to classification) (Mudgal et al., 2009). MICMAC analysis helps to determine the dependence power and driver power of the factors. Post that the factors are categorized into four clusters, autonomous, dependent, linkage, and independent.

An ISM analysis of the influence of blockchain on banking involves mapping out the relationships between the numerous factors affecting the adoption and implementation of blockchain technology in the banking sector. These factors identified have an impact on the adoption of blockchain technology in the banking sector, and they may also have relationships with each other, either reinforcing or undermining the impact of each other. An ISM analysis involves mapping out these linkages and identifying the key drivers and constraints affecting the application of blockchain technology in the Indian banking sector.

The relationships between these factors are as follows:

- Technological readiness affects organizational readiness. Banks with a strong readiness to adopt and integrate technology will be more successful in implementing blockchain.
- Organizational readiness affects the regulatory environment. Banks with a strong readiness to adopt and integrate technology will be better positioned to comply with regulations.
- Technological readiness affects customer demand. The availability of blockchain technology will influence customer demand for blockchain-based products and services.
- Customer demand affects economic viability. Banks will be more likely to adopt blockchain if there is a demand for it from their customers.
- Economic viability affects the regulatory environment. A favorable cost-benefit analysis of blockchain will influence regulators to create a favorable regulatory environment for its adoption.
- Competition affects customer demand. Competition among banks will drive customer demand for blockchain-based products and services.

The decision regarding the nature of relationships between factors was made through expert opinions and secondary research. The factors are set as presented in table 2:

Table 2: Factors Identified

Factor Name (Notation)	Factor
F1	Technology Readiness
F2	Organizational Readiness
F3	Competitive Pressure
F4	Regulatory Environment
F5	Customer Demand
F6	Economic Viability

Source: Author's Compilation

The next step required analyzing and evaluating the inter-relationships between the factors in a system. This is done by creating a structural self-interpretation matrix (SSIM). This SSIM identifies the hierarchy of the factors along with the level of dependence and independence between them. It is used to create a structural model of the system. This model helps to formulate strategies to handle and manage the system and achieve the required performance goals. When inspecting the connections between the factors say p and q four symbols are being used: V, A, X, and O. Each of these symbols represents a different direction of association between the two factors. This is as presented in table 3

Table 3: Direction of the association between the factors

Direction of the Factors	Marked
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If p leads to q	V
If q leads to p	A
If p and q lead to each other	X
If p and q are not related	O

Based on appropriate linkages, structural self-interpretation matrix (SSIM) has been created as is given in table 4:

Table 4: Structural Self-Interpretation Matrix (SSIM)

Factor	F6	F5	F4	F3	F2	F1
F1	O	V	A	O	V	X
F2	O	O	O	V	X	
F3	O	O	O	X		
F4	V	V	X			
F5	V	X				
F6	X					

Source: Author's Compilation

Next is the creation of the reachability matrix. This matrix shows if one factor can reach another directly or through a series of steps. It helps to find which factors are more important and how they depend on each other. As this matrix is binary in nature, it is achieved by replacing V, A, X, and O with 1, 0 and incorporating transitivity criteria. The objective is to formulate the initial reachability matrix as presented in table 5.

Table 5: Initial Reachability Matrix

Factor	F6	F5	F4	F3	F2	F1
F1	0	1	1	0	1	1
F2	0	0	0	1	1	0
F3	0	0	0	1	0	0
F4	1	1	1	0	0	0
F5	1	1	0	0	0	0
F6	1	0	0	0	0	0

Source: Author's Compilation

Next, the final reachability matrix is created from the initial reachability matrix as presented in table 6. It is formed by considering the transitivity rule, if variable p is associated to variable q , and variable q is associated to variable r , then variable p is also associated to variable r .

Table 6: Final Reachability Matrix (Transitivity in the Matrix)

Factor	F6	F5	F4	F3	F2	F1	Driving Power
F1	0	1	1	0	1	1	4
F2	0	0	0	1	1	0	2
F3	0	0	0	1	0	0	1
F4	1	1	1	0	0	0	3
F5	1	1	0	0	0	0	2
F6	1	0	0	0	0	0	1

Dependence Power	3	3	2	2	2	1	
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Source: Author's Compilation

Table 6 also presents the driving power and the dependence of each factor. Driving power and dependence power for each factor is the total number of factors to which it may affect and total number of factors which may be affecting it respectively. These two, driving power and dependence power are required in MICMAC analysis to classify the factors into four clusters namely, autonomous, dependent, linkage, and independent factors.

Subsequently, level partitioning is performed as presented in table 7. It helps in identifying autonomous factors and classifying the factors based on levels. Autonomous factors are those that are not influenced by any other factor in the system. These are identified by selecting the factors that are not present in the reachability sets of any other factor. The levels of the factors are then identified based on their interdependence. The factors that are not influenced by any other factor are placed at the topmost level. The factors that are influenced by the autonomous factors are placed at the second level, and so on. The factors that influence the factors at a given level are placed at the next higher level.

Table 7: Level Partitioning of Factors

Factors		Reachability Set (Factors influenced)	Antecedent Set (Factors influencing)	Intersection Set	Level
F1	Technology Readiness	1,2,4,5	1,3,6	1	IV
F2	Organizational Readiness	2,3	1,2,4,5,6	2	II
F3	Competitive Pressure	3	1,2,3,4,5,6	3	I
F4	Regulatory Environment	4,5,6	1,2,3,4	4	V
F5	Customer Demand	5,6	1,2,3,4,5	5	III
F6	Economic Viability	4,5,6	1,2,3,6	6	IV

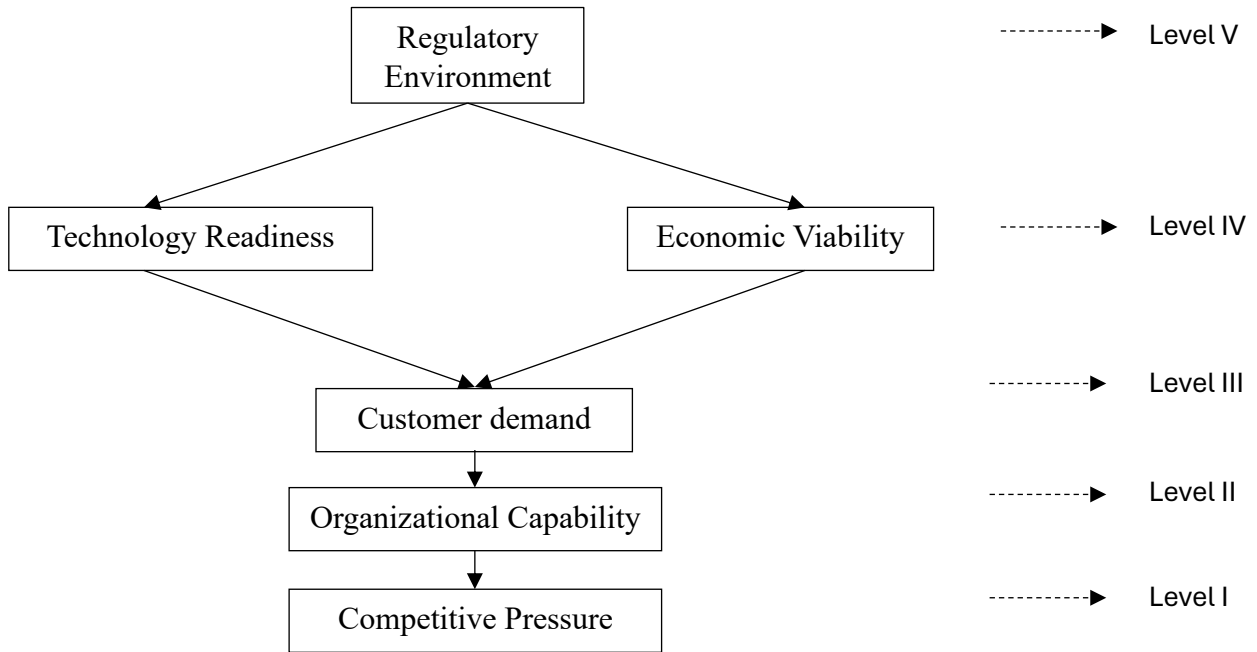
Source: Author's Compilation

It can be seen that factor 3, i.e. competitive pressure is ranked highest, showing it is an autonomous factor that is not influenced by any other factor in the system. Competitive pressure has the highest level of independence and the lowest impact on the system. Organizational readiness is the factor at level II. It is directly influenced by the autonomous factors at level I. Organizational readiness has a moderate level of independence and a higher impact on the system than the level I factor like competitive pressure. Customer demand is the factor at level III. It is influenced by the level 2 factors and has a higher level of dependence on the system. It has a substantial effect on the system and is one of the significant factors for overall performance. It can have a substantial influence on the adoption and impact of blockchain technology in banking. It has the ability to offer several benefits to customers, such as faster and more secure transactions, reduced fees, and greater transparency. Technology readiness and economic viability are the factors at level IV. The remaining factor, i.e., regulatory environment is the factor at level V.

This was followed by the creation of a digraph to explain the model as presented in figure 2. The digraph shows a visual representation of how factors are connected, based on the different levels

found through repeated cycles. To create this, transitivity links were taken out and specific factors were put in their place. This made an ISM-based model that organizes the factors hierarchically. This model captures the complex connections and importance of each factor.

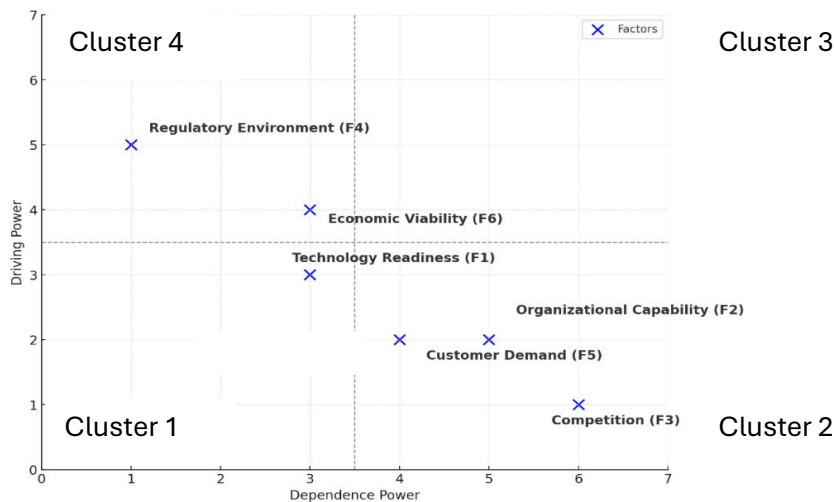
Figure 2: The Interpretative Structural Model formed for factors enabling blockchain in banking



Source: Author’s Compilation

In the next step MICMAC Analysis is performed. MICMAC analysis is a decision-making tool that helps in identifying the most influential and dependent factors among a set of factors. The visual representation of the MICMAC analysis is depicted in figure 3.

Figure 3: Graphical representation of the MICMAC analysis of the factors



Source: Author’s Compilatio

As in figure 3, factors are classified into four clusters depending on the driving power and dependence power of each factor. The first cluster is an autonomous cluster. It has weak driving power and weak dependence power. Factor F1 falls under the autonomous cluster indicating that this factor can be detached from the system. The second cluster is a dependent cluster which has weak driving power and strong dependence power with F2, F3 and F5 falling under it. On the contrary, F4 and F6 are independent factors with strong driving power and weak dependence power. This indicates that factors like organizational readiness, competitive pressure and customer demand hinge on each other in the system, while regulatory environment and economic viability operate independently and influence other factors.

Regulatory environment has the most balanced position in the dependence vs driving power graph, thereby causing it to become the most influential factor while implementing blockchain integration by banks, as confirmed by the ISM study results. Technology Readiness and Economic viability have high driving force and high dependence respectively, thereby they also have a significant level of impact on the implementation of blockchain in banking by different financial institutions.

5. Conclusion

The research question assesses the key factors that enable blockchain adoption in banking and financial institutions. The study adopted ISM and MICMAC analysis to identify and explore the key factors affecting the adoption of blockchain technology in the banking sector. The study classifies these factors and highlights their interdependence. This provides actionable insights for stakeholders aspiring to adopt blockchain technology in banking and financial institutions.

The results and findings show that government regulations and regulatory support play an important role in blockchain adoption. Banks and financial institutions are also required to work on their technological readiness by investing in infrastructure development, and cybersecurity processes. Customers' trust is also important in blockchain adoption as customer demand affects organizational preparedness. Organizational readiness is important for successful integration of blockchain. Banks and financial institutions adopting blockchain improve transaction security, efficiency and speed and hence gain a competitive edge.

The outcome of the study shows that regulatory frameworks, economic feasibility, and technological preparedness drives blockchain adoption in banking in India. Competitive pressure emerged as an important enabler for blockchain deployment, while customer demand and organizational readiness also play important roles. By addressing challenges around regulatory framework, investment in technology and improving organizational capabilities, banks can adopt blockchain to transform financial services, improve security, and steer innovation in the banking sector.

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