ISSN:2336-2693 | E-ISSN:2336-4890

FACTORS AFFECTING THE ADOPTION OF BLOCKCHAIN IN INDIAN STOCK MARKETS: AN EMPIRICAL STUDY

Neeti Misra[1,2] , Sumeet Gupta[1] T. Joji Rao[3]
[1]SoB, University of Petroleum and Energy Studies, Dehradun, India.
[2]UIM, Uttaranchal University, Dehradun, India.
[3]O.P. Jindal Global University, Sonipat, Haryana.

Abstract:
The adoption of blockchain and stock markets is increasing attention from stakeholders, brokers, secondary markets, and regulators. Blockchain technology has a remarkable potency to be used to maintain reliable, transparent data records for the number of transactions that take place in the stock markets. However, there are certain factors discussed in literature having an impact on the adoption of the technology, specifically in developing countries. The current study aims to confirm such factors affecting the adoption of blockchain in the Indian stock markets. Factor analysis techniques have been used to explore the factors. The findings of the study confirmed the technological, organizational, and market factors of blockchain technology influencing the adoption of technology in Indian stock markets.
Keywords: Business environment, Blockchain, Indian Stock Markets, Adoption of technology.

Introduction

The stock market of a nation plays an eminent role in economic growth. The secondary market offers opportunities that attract both potential and existing investors to trade and exchange securities (Nazir et al., 2010). It is a podium composing of financial and administrative administrations that contribute in exchanging shares, bonds, or other securities in a transaction recognized as trade (Al-Shaibani et al., 2020). The performance of stock exchange of a country also effects the GDP of that country (C. H. Perera et al., 2021). The conventional structure of the working of stock exchange suffers from a number of drawbacks and shortcomings (London & Hart, 2004). The problems are like extended recovery time, data auditing, non-transparency of data resulting in the complexity of overall trading platform system architecture (Al-Shaibani et al., 2020) (Frolov, 2021).

In the recent times of IT development and globalization, the usage of blockchain is rising across the industrial divisions from logistics processes to engineering and public services, it has been mounting most swiftly in economic services (Attaran & Gunasekaran, 2019). Typically, a Blockchain, serves as a public financial transaction database (Rahim et al., 2020). The furthermost general connotation is Cryptocurrency, which can be used as an intermediate for exchanging where specific coin ownership registers are deposited in a ledger existing in terms of computerized database with the help of robust cryptography to keep the transaction records, to control the mechanism of creating more coins, and to verify the transfer of coin ownership (Ertz & Boily, 2019) (Okeke et al., 2022). The procedure of conversion of ordinary plain text into unintelligible text and vice versa is observed as cryptography (Mandal et al., 2012). It can be understood as a system of storing and transmitting data in a specific form so that only those whom it is intended and read and process it (Dagher et al., 2018). The task of management of the mechanism of creation, distribution and maintenance of Bitcoins is also not done by a central bank, rather the process utilizes the decentralized technology to enable the users undergo safe

ISSN:2336-2693 | E-ISSN:2336-4890

payments and store money without the need to use their name or go through a bank (S. Perera et al., 2020). The system works on the basis of a distributed public ledger called Blockchain, which is to keep archive of all transactions updated and apprehended by currency holders (Fanning & Centers, 2016).

In the current times many people across the globe are investing in Dogecoin, Bitcoin and other crypto-currencies, using the platforms like Crypto.com app, CoinDCX and some electronic wallets. All such transactions are measured by market capitalization and amount of data stored on its blockchain. While using such online platforms, you can do multiple things like buying and selling coins without any risk of fraud, block chain enable the participants to publish their transactions with transparency and reliability.

Blockchain can be understood as "a mechanism involving digital assets and two or more parties, where some or all of the parties' put assets in and assets are automatically redistributed among those parties according to a formula based on certain data that is not known at the time the contract is initiated" (Buterin, n.d.), para. 2. Blockchain technology has a remarkable potency to be used to maintain reliable, transparent data records for the number of transactions take place in the stock markets. However, there are certain factors discussed in literature having the impact on the adoption of the technology, specifically in developing countries. In this paper the various institutional, market and technological factors are identified using the confirmatory factor analysis.

Review of Literature

A number of studies conducted in past proved that the secondary market of a country has important contribution in mobilizing the savings of surplus sector and directing towards the deficit sector of an economy; results in financial and economic development (Levine & Zervos, 1996) (Ake, 2010). The adoption of blockchain technology depends upon complex socio-technical structures having impact on the acceptance level of the stock market participants. A holistic conceptual model is proposed by (Janssen et al., 2020) for the adoption of blockchain technology in an organisations integrating the technological, organisational and environmental factors which could have impact on the adoption of blockchain technology.

The blockchain technology has been used in various ways by the organizations as well as the blockchain communities (Ku-Mahamud et al., 2019). A study analysed the cause and effect association between the different hurdles in the adoption of blockchain technology in the supply chain sector and confirmed that the proper alignment of the technology with the system is most important for the success of technology (Bag et al., 2021). The adoption of this technology has resolved a number of problem in the food supply chain sector (Chen et al., 2021) explained with the help of thematic analysis of the processes, benefits and problems. The successful adoption of blockchain technology in a system depends upon the integration of institutional, market and technical factors (Janssen et al., 2020), presented in the form of conceptual framework after enclosing all the challenges and issues in the adoption of technology. An imperative structural modelling approach has been used to check the various barriers in the adoption of blockchain (Mathivathanan et al., 2021). In a study the UTUAT model has been used to integrate the antecedents in cognitive context to analyse the adoption of encrypted database technology called blockchain (Khazaei, 2020).

(Rijanto, 2020) in his study focussed on the application of certain theories and practices in order

 ISSN:2336-2693 | E-ISSN:2336-4890

to successfully adopt the technology in the system in both practical and theoretical aspects along with the support of government. The technology has great potential to reshape the economic growth of the country as it can minimize the cost of transactions (Iansiti & Lakhani, n.d.). The disruptive technology is a central prerequisite for greater answerability and distinguishability (Ullah et al., 2021). In the data driven world, the technical variables are the major concern such as data integrity (Wang et al., 2016), Accessibility- (Attaran & Gunasekaran, 2019), Disintermediation (Guo & Liang, 2016) and Infrastructure (Shrier et al., 2016). Being qualitatively more quantified and efficient is equally important in terms of organizational readiness (Guo & Liang, 2016), along with senior executive support, blockchain knowledge, information intensity (Shrier et al., 2016). Another important concern in the adoption of blockchain is from the external environment, the way it is going to be regulated. The numerous usages of technology itself which may call to regulatory constrictions (Wang et al. 2016), along with , industry pressure, market dynamics and government support (Crosby, 2016) (Saberi et al., 2019).

Methods:

The empirical study has been conducted from the view point of industry people. The participants in the sample are the brokers and stock market traders, selected using purposive sampling. The responses are solicited using questionnaire on the 5-point Likert scale from 150 participants. The scale is adapted from the past literature, mentioned in table 1. In order to confirm the factors, the confirmatory factor analysis technique has been used to analyse the data on SPSS software.

Factors	**Variables**	**Adapted from**
Technological factors	Data Integrity	Wang et al., 2016)
	Accessibility	Attaran & Gunasekaran, 2019
	Disintermediation	Guo & Liang, 2016
	Infrastructure	(Shrier et al., 2016).
Organizational factors	Organizational readiness	Guo and Liang (2016), Shrier et al. (2016)
	Senior executive support	
	Blockchain knowledge	
	Information intensity	
Market factors	Regulatory environment	Wang et al. (2016), Crosby et al. (2016)
	Industry pressure	
	Market dynamics	
	Government support	

Data Analysis and Results

Reliability Analysis:

To quantify the internal consistency of a set of variables of adoption of blockchain, reliability analysis has been used. The value for Cronbach's Alpha for the 12 statements of blockchain adoption dimensions was found to be 0.78 which was more than 0.7, hence acceptable (Richardson, 2011).

 ISSN:2336-2693 | E-ISSN:2336-4890

Table 2 Reliability results

Variables	No. of Items	Cronbach's Alpha
Technological variables	4	0.756
Organizational variables	4	0.745
Market Variables	4	0.804
Adoption of Blockchain	12	0.78

Confirmatory factor analysis (CFA) was applied to confirm the already extracted factor structure of a large set of observed variables (Selim, 2007). To assess the factorability of the data Bartlett's test of sphericity and the Kaiser- Meyer- Olkin (KMO) measure of sampling adequacy (Sezer & Yilmaz, 2019) have been used.

The results of KMO and Bartlett's test, applied on the variables, showed that KMO index is high at 0.717 greater than 0.5, hence acceptable (Ding et al., 2015) and the approx. chi square is 19454.4, with the significance less than 0.05, hence the data is appropriate for factor analysis as shown in table 5.31. Thus, it can be confirmed that factor analysis is suitable for the analysis.

Table 3 KMO and Bartlett's Test for the CFA

S.No.	Test	Test Particulars	Test Result(s)
1	Kaiser-Meyer-Olkin Measure	KMO	.717
2	Bartlett's Test of Sphericity	Approx. Chi-Square	19454.4
		Df	496
		Sig.	.000

Source: Computed from the Primary Data

Table 4 Factors based on Eigen Values

Factors	Initial EV	Extraction SOS Loadings			Rotation SOS Loadings		
		Total	Percentage of Variance	Cumulative	Total	Percentage of Variance	Cumulative
1	3.903	3.903	12.196	12.196	3.508	10.963	10.963
2	3.304	3.304	14.326	26.522	3.331	24.411	35.374
3	2.854	2.854	18.917	45.439	3.286	20.268	55.642

Source: Computed from the Primary Data

The data have been concise by Principal Component Matrix along with Rotation Method: Varimax with Kaiser Normalization. The communalities among the different items are also found to be greater than 0.736, shown in table 1. The factors are extracted on the basis of eigenvalues greater than one. The cumulative percentage of variance of the five factors is found to be 43.10.

The first factor-technological is explained by four variables, named as Data Integrity, Accessibility, Disintermediation and Infrastructure with 12.196 percentage of variance. The

 ISSN:2336-2693 | E-ISSN:2336-4890

second factor is explained by a list of four variables- Organizational readiness, Senior executive support, Blockchain knowledge and Information intensity, named as 'Organizational factors,' with 214.326 variance. The third factor is explained by a list of four variables- Regulatory environment, Industry pressure, Market dynamics and Government support, named as 'Market factor,' with 18.917 variance.

Table 5 Factors with descriptive statistics, factor loadings and communalities

Factors	Variables	Mean	SD	Factor Loadings	Comm.
Technological factor	Data Integrity	3.30	1.05	.941	.803
	Accessibility	3.46	1.34	.925	.914
	Disintermediation	3.42	1.33	.911	.905
	Infrastructure	3.76	1.19	.818	.925
Organizational factor	Organizational readiness	3.74	1.14	0.88	0.89
	Senior executive support	3.72	1.11	0.83	0.858
	Blockchain knowledge	3.62	1.12	0.819	0.738
	Information intensity	3.52	1.37	0.77	0.749
Market factor	Regulatory environment	3.80	0.83	.927	.853
	Industry pressure	3.96	0.88	.905	.946
	Market dynamics	3.84	0.82	.849	.685
	Government support	4.04	1.07	.805	.745

The mean values, standard deviation, factor loadings and communalities of the blockchain adoption variables are shown in table 6. The factor loadings are higher for the variables of technological factor such as data integrity (.941), accessibility (.925), disintermediation (.911) and infrastructure (.818), followed by the variables of market factor such as Regulatory environment (.927), Industry pressure (.905), Market dynamics (.849) and Government support (.805). The factor loadings are lower for the variables of organizational factors such as organizational readiness (0.88), senior executive support (0.83), blockchain knowledge (0.819) and information intensity (0.77). Thus, it can be concluded that technological factor is most important having impact on the adoption of blockchain in Indian stock markets; followed by market factor and organizational factor.

Implications and Future Scope

Managers and the financial market players need to focus on such factors having impact on the adoption of blockchain in the stock markets and will assist them in the development of system with the alignment of blockchain technology. This study extends the knowledge base by confirming the factors influencing the adoption of blockchain in the stock markets and future research can be conducted in identifying the barriers to the adoption of this technology in the secondary markets.

ISSN:2336-2693 | E-ISSN:2336-4890

References:

Ake, B. (2010). *The Role of Stock Market Development in Economic Growth: Evidence from Some Euronext Countries* (SSRN Scholarly Paper ID 2012518). Social Science Research Network. https://papers.ssrn.com/abstract=2012518

Al-Shaibani, H., Lasla, N., & Abdallah, M. (2020). Consortium Blockchain-Based Decentralized Stock Exchange Platform. *IEEE Access*, *8*, 123711–123725. https://doi.org/10.1109/ACCESS.2020.3005663

Attaran, M., & Gunasekaran, A. (2019). Blockchain-enabled technology: The emerging technology set to reshape and decentralise many industries. *International Journal of Applied Decision Sciences*, *12*(4), 424–444. https://doi.org/10.1504/IJADS.2019.102642

Bag, S., Viktorovich, D. A., Sahu, A. K., & Sahu, A. K. (2021). Barriers to adoption of blockchain technology in green supply chain management. *Journal of Global Operations and Strategic Sourcing*, *14*(1), 104–133. https://doi.org/10.1108/JGOSS-06-2020-0027

Buterin, V. (n.d.). *A NEXT GENERATION SMART CONTRACT & DECENTRALIZED APPLICATION PLATFORM*. 36.

Chen, S., Liu, X., Yan, J., Hu, G., & Shi, Y. (2021). Processes, benefits, and challenges for adoption of blockchain technologies in food supply chains: A thematic analysis. *Information Systems and E-Business Management*, *19*(3), 909–935. https://doi.org/10.1007/s10257-020-00467-3

Crosby, M. (2016). *BlockChain Technology: Beyond Bitcoin*. *2*, 16.

Dagher, G. G., Mohler, J., Milojkovic, M., & Marella, P. B. (2018). Ancile: Privacy-preserving framework for access control and interoperability of electronic health records using blockchain technology. *Sustainable Cities and Society*, *39*, 283–297. https://doi.org/10.1016/j.scs.2018.02.014

Ding, Z., Zuo, J., Wu, J., & Wang, J. (2015). Key factors for the BIM adoption by architects: A China study. *Engineering, Construction and Architectural Management*, *22*(6), 732–748. https://doi.org/10.1108/ECAM-04-2015-0053

Ertz, M., & Boily, É. (2019). The rise of the digital economy: Thoughts on blockchain technology and cryptocurrencies for the collaborative economy. *International Journal of Innovation Studies*, *3*(4), 84–93. https://doi.org/10.1016/j.ijis.2019.12.002

Fanning, K., & Centers, D. P. (2016). Blockchain and Its Coming Impact on Financial Services. *Journal of Corporate Accounting & Finance*, *27*(5), 53–57. https://doi.org/10.1002/jcaf.22179

Frolov, D. (2021). Blockchain and institutional complexity: An extended institutional approach. *Journal of Institutional Economics*, *17*(1), 21–36. https://doi.org/10.1017/S1744137420000272

Guo, Y., & Liang, C. (2016). Blockchain application and outlook in the banking industry. *Financial Innovation*, *2*(1), 24. https://doi.org/10.1186/s40854-016-0034-9

Iansiti, M., & Lakhani, K. R. (n.d.). *The Truth About Blockchain*. 12.

Janssen, M., Weerakkody, V., Ismagilova, E., Sivarajah, U., & Irani, Z. (2020). A framework for analysing blockchain technology adoption: Integrating institutional, market and technical factors. *International Journal of Information Management*, *50*, 302–309. https://doi.org/10.1016/j.ijinfomgt.2019.08.012

Khazaei, H. (2020). Integrating cognitive antecedents to utaut model to explain adoption of

ISSN:2336-2693 | E-ISSN:2336-4890

blockchain technology among malaysian smes. *International Journal on Informatics Visualization*, *4*(2), 85–90. https://doi.org/10.30630/joiv.4.2.362

Ku-Mahamud, K. R., Omar, M., Bakar, N. A. A., & Muraina, I. D. (2019). Awareness, trust, and adoption of blockchain technology and cryptocurrency among blockchain communities in Malaysia. *International Journal on Advanced Science, Engineering and Information Technology*, *9*(4), 1217–1222. https://doi.org/10.18517/ijaseit.9.4.6280

Levine, R., & Zervos, S. (1996). Stock Market Development and Long-Run Growth. *The World Bank Economic Review*, *10*(2), 323–339. https://doi.org/10.1093/wber/10.2.323

London, T., & Hart, S. L. (2004). Reinventing strategies for emerging markets: Beyond the transnational model. *Journal of International Business Studies*, *35*(5), 350–370. https://doi.org/10.1057/palgrave.jibs.8400099

Mandal, A. K., Parakash, C., & Tiwari, A. (2012). Performance evaluation of cryptographic algorithms: DES and AES. *2012 IEEE Students' Conference on Electrical, Electronics and Computer Science*, 1–5. https://doi.org/10.1109/SCEECS.2012.6184991

Mathivathanan, D., Mathiyazhagan, K., Rana, N. P., Khorana, S., & Dwivedi, Y. K. (2021). Barriers to the adoption of blockchain technology in business supply chains: A total interpretive structural modelling (TISM) approach. *International Journal of Production Research*, *59*(11), 3338–3359.

Nazir, M. S., Nawaz, M. M., & Gilani, U. J. (2010). Relationship between economic growth and stock market development. *African Journal of Business Management*, *4*(16), 3473–3479. https://doi.org/10.5897/AJBM.9000484

Okeke, U., Bans-Akutey, A., & Sassah-Ayensu, M. (2022). *Benefits and Risks Associated With the Use of Blockchain and Cryptocurrency as a Form of Payment in Ghana: A Case Study of Selected Bitcoin Trading Companies.*

Perera, C. H., Nayak, R., & Nguyen, L. T. V. (2021). The impact of subjective norms, eWOM and perceived brand credibility on brand equity: Application to the higher education sector. *International Journal of Educational Management*, *35*(1), 63–74. https://doi.org/10.1108/IJEM-05-2020-0264

Perera, S., Nanayakkara, S., Rodrigo, M. N. N., Senaratne, S., & Weinand, R. (2020). Blockchain technology: Is it hype or real in the construction industry? *Journal of Industrial Information Integration*, *17*, 100125. https://doi.org/10.1016/j.jii.2020.100125

Rahim, R., Patan, R., Manikandan, R., & Kumar, S. R. (2020). Introduction to Blockchain and Big Data. In *Blockchain, Big Data and Machine Learning*. CRC Press.

Richardson, J. W. (2011). Technology Adoption in Cambodia: Measuring Factors Impacting Adoption Rates. *Journal of International Development*, *23*(5), 697–710. https://doi.org/10.1002/jid.1661

Rijanto, A. (2020). Business financing and blockchain technology adoption in agroindustry. *Journal of Science and Technology Policy Management*, *12*(2), 215–235. https://doi.org/10.1108/JSTPM-03-2020-0065

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, *57*(7), 2117–2135.

Selim, H. M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & Education*, *49*(2), 396–413.

ISSN:2336-2693 | E-ISSN:2336-4890

https://doi.org/10.1016/j.compedu.2005.09.004

Sezer, B., & Yilmaz, R. (2019). Learning management system acceptance scale (LMSAS): A validity and reliability study. *Australasian Journal of Educational Technology*, *35*(3), Article 3. https://doi.org/10.14742/ajet.3959

Shrier, D., Wu, W., & Pentland, A. (2016). *Blockchain & Infrastructure (Identity, Data Security)*. 18.

Ullah, N., Al-Rahmi, W. M., Alzahrani, A. I., Alfarraj, O., & Alblehai, F. M. (2021). Blockchain technology adoption in smart learning environments. *Sustainability (Switzerland)*, *13*(4), 1–18. https://doi.org/10.3390/su13041801

Wang, H., He, D., & Tang, S. (2016). Identity-Based Proxy-Oriented Data Uploading and Remote Data Integrity Checking in Public Cloud. *IEEE Transactions on Information Forensics and Security*, *11*(6), 1165–1176. https://doi.org/10.1109/TIFS.2016.2520886