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EMERGING REVENUE MODELS ADOPTING BLOCKCHAIN TECHNOLOGY BY INDIAN TELECOM COMPANIES - A TAXONOMY

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ABSTRACT

Blockchain became widely popular in 2009 due to the invention of Bitcoin. In India, Telecom operators being in an emerging market, have huge untapped potential for using blockchain for revenue generation.

There is a dearth of academic research in the area of developing blockchain enabled revenue models specific to telecom industry.

Hence the objective of this paper is to identify the revenue models which can be employed in telecom companies by adopting blockchain technology. This study tries to add to the literature by exploring the following aspects a) The attributes of Indian telecom companies for adoption of blockchain (b) The bottlenecks for this adoption and risk associated and (c) viability of use cases which can be implemented by Indian telecom companies.

Primary data was collected in the form of expert interviews and the data was analysed using regression techniques with the help of SPSS to develop the conceptual model..

1. Introduction

Blockchain can be defined as that technology which allows data to be exchanged and stored on a peer-to-peer (P2P) basis [1]. It is also defined as

decentralized distributed ledger that is replicated on all nodes for peer-to-peer participation in the system [2]. Blockchain touted by many as the be-all-end-all solution for digital transfer of value [1]. Blockchain emerged from two concepts: a) Asymmetrical Cryptography and (b) IT Architecture- Distributed Asymmetrical Cryptography permit anonymous users to transfer data based on public and private key. Distributed systems mean that there is no central node as that of Internet and downtime of one system would not affect another. The blockchain operates in a decentralized, on-going manner using consensus algorithm which certify the information per block. Validation of block leads to its addition in blockchain and shared with network. The change of single block requires entire blockchain to be changed. Thus, two pillars, Asymmetrical Cryptography and Distributed IT Architecture act as a secure environment which establishes trust for exchange of information, novel transactions, and smart contracts.

Studies have shown that blockchain technology provides various benefits to organizations. They help in reduction of KYC (Know Your Customer) costs which are costly as well as a time consuming [4]. The data centralization model which is widely adopted makes the organizations extremely vulnerable to cyber-attacks resulting in loss of millions of personal data, on blockchain data is decentralized thus information is protected (Pauline et al 2019)1. Thanks to the blockchain technology as maximum processes can be automated rendering more security since the human intervention is minimal.[1]

Gartner forecasted that blockchain global market value to be US\$ 96 billion by 2024, that includes \$3.2 billion dollars from markets like MENA which are emerging [3]. Literature review has shown that revenue in blockchain is mostly concentrated in three key industries: Banking, Manufacturing and Financial services as shown below:[5]



. **Fig 1:** Graph showing the percentage of blockchain revenue concentration across sectors:

Source: NASSCOM Avast India Blockchain Report,2019

The above graph states that revenue generated in blockchain from Technology, Media and Telecom is mere 5% whereas total blockchain revenue in emerging markets is USD \$3.2billion dollars [5]. Hence it can be seen that there is huge untapped potential in blockchain segment which can be monetized by telecom operators in India.

Objective of the paper: Thus, aim of this paper is to identify the revenue models which can be employed by Indian telecom companies by adopting blockchain technology to maximize their revenue. The attributes of Indian telecom companies which help them in implementing blockchain revenue

models are studied. Evaluation of the bottlenecks for this adoption and risk associated with the same are explored.

2. Literature Review

2.1) Foundation of Blockchain:

Business, Economic and Social Transformation generally happen by enabling emerging technologies [6]. Blockchain stands at top 5 emerging digital technologies, according to Gartner Hype cycle, 2018 [7]. Concept of blockchain technology dates back to the white paper written by Satoshi Nakamoto in 2008 [8]. It was introduced as peer-to-peer genre of electronic money transfer without any centralized financial intermediary. A new ledger was devised which was named as ‘chain of blocks’ [8]. These blocks help in the transfer of cash electronically which was later coined as blockchain [9]. The functioning of blockchain can be understood by these six steps:[10]

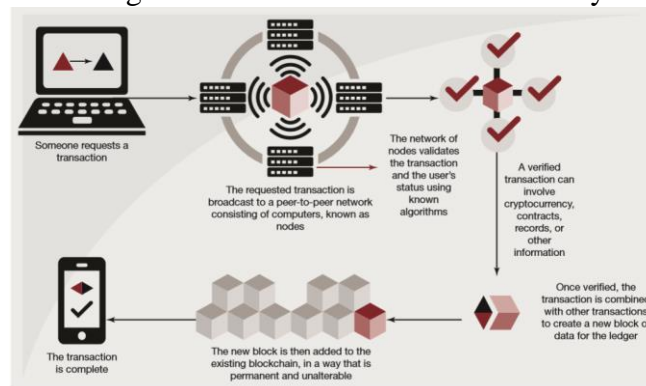


Fig 2: Showing the six steps used in blockchain. Source: Blockchain for MENA telecom operators

Thus, it can be said that decentralized store of data is blockchain [11] and it is analogues to a database of information systems which are streamlined in real time and legitimized by the user base for secure documentation [12]. Based on the type of user access there exists private and public blockchain. In a public blockchain the identity of the interacting parties is entirely anonymous [13]. Generally public blockchains are used for implementing smart contracts. Private blockchain allows only pre-validated users to access or view the ledger. Consortium model is another version in which blockchain operation is done by group of leadership. In contrast to public blockchains, private or consortium blockchains can be accessed only by pre-defined user's thus providing added security, lower costs, high reliability, trust [14].

2.2 Related work

Blockchain has received much of the attention on its ability to predominantly transform financial services industry [15], but there is an influence of blockchain beyond financial services industry [16] and environ any business. Various use cases were developed in utilizing blockchain across varied industries. These studies range from improving agri-food traceability by using blockchain technology [17] to its application in music industry for protecting the creative rights of artists [18]. Some studies focussed on use-cases of how

blockchain can be used as protective mechanism for securing sensitive IoT data [19]

Use cases and proof of concepts are readily available in telecommunications sector which are developed by vendors, telecom software companies, operators for identity management [20], In the near future fraud prevention, initial coin offering, Smart contracts, Security, Data monetization can be few use cases that can be offered by telecom operators [21]. In terms of attributes telecom operators possess Business model flexibility, Easy access to market, Customer reach, Trust, Partnership ecosystem and cyber security [3] that provides operators a strong ground to implement and profit from blockchain. The implementation of blockchain will not only create revenue but also decrease the total cost by reducing intermediately costs, search costs and transaction costs.[22] The reduction is also seen due to the manual process elimination and reduction in IT costs [23]. Though blockchain seems feasible in creation of novel revenue paths but practically many risks exists to materialize the benefits[24]. The barrier for adoption in business is created because of perceived infancy of blockchain technology [25]. The lack of expertise also restricts the widespread adoption of blockchain [3]. The risks are perceived in terms of irreconcilable models of blockchain, unidentified running costs and poor interoperability [26]. The communication between the existing legacy systems and blockchain applications need to be seamless [27] unfortunately clarity lacks in these restructuring systems [28]. The other risk includes Governance & legal due to lack of appropriate policies [29] which raise issues regarding legal developments while transacting with these technologies. Challenges exist elated to vulnerabilities, security, and policies [30]. The possibility of security risk exists to modify the transactions in ledger if more than 51% of computing power is controlled by a miner [24].

3. Research Methodology

The methodology used for this research is to obtain expert opinion to signify the relationship between dependent and independent variable. Interval scale was used as it helps to perform arithmetic on the data collected from respondents. Broad set of people are considered ranging from CXO level policy makers of an organization to the technical development employees. A questioner was developed with 17 questions and statistical survey was conducted from 1st June 2020 till 27th June 2020, it included the variables which can help us to create an optimized revenue model for telecom companies. The questions were pertaining to attributes of telecom companies, perceived risks and benefits and feasibility or viability of the implementation. The respondents have described what they perceive about the different factors on a five pointer Likert scale that ranges from 1 (Strongly agree) to 5 (Strongly disagree). The sample size is of 45 out of which 45% belong to blockchain developers, 24.2% are from consulting arena, Senior management include 9.1%, 6.1% include Project Management and Operations include other 9.1%. These respondents belong to those companies which work on ICT technology or act as consulting firms who implement ICT technologies for the client.

4. Concept And Hypotheses Formulation

Blockchain the aim of this paper is to create a revenue model that can be adopted by Indian Telecom companies utilizing blockchain technology. The factors which are being tested for successful creation of revenue model are called determinants. Each Determinant consists of set of features. The final revenue model suggested consists of combination these features from each determinant. The determinants and features are as follows:

(i) Attribute Capabilities

Telecom operators have a unique capability like Business Model Flexibility, Easy access to market, Customer Reach, Trust, Partnership Ecosystem and Security.

(ii) Perceived Benefits:

Improved business efficiency, Identifying new ways of automatic business process, Better transaction speed, Lower operational cost, Enabling new business models (Like Blockchain-as-a-service etc.), Time Saving (Reduced time for finding information, verifying transactions, Bill Settlements etc), Reduction of Risks (Tampering, unintentional loss of data etc.)

(iii) Perceived Risks:

Governance Challenges, Evolving Legal Laws, Scalability, Identifying business use-cases and their practical implementation, Cost Effectiveness, Limited Market for available Blockchain Solutions

(iv) Viability of Implementation:

Asset Management, Contract Management, Customer Verification, Regulatory Compliance, Risk Management, Customer Experience, Smart Bandwidth Monitoring, Block-chain-as-a-Service, Prototyping and use case development, Enterprise Services. The conceptual model is as follows:

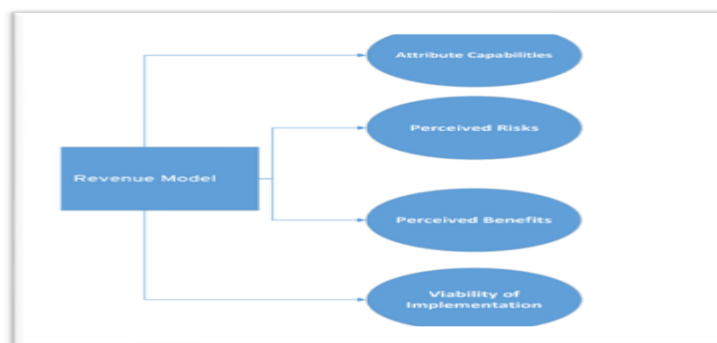


Fig 3: Research Methodology Diagram

Each of the features in four determinants are rated using the questioner and statistically analysed using SPSS software. The hypotheses are as follows:

H1: Attribute capability to implement blockchain technology is a significant factor in revenue generation of a telecom company

H2: Perceived Risk in implementing blockchain technology is a significant factor in revenue generation of a Telcom Company.

H3: Perceived Benefits in implementing blockchain is a significant factor in revenue generation in a telecom company.

H4: Viability of implementing a blockchain technology is a significant impact in revenue generation in a telecom company.

In order to test the four hypotheses Regression is performed. Then after establishing that there exists a significant statistical relationship between the four determinants with revenue model, we proceed towards exploratory factor analysis to suggest different revenue models.

5. Results And Discussions

The analysis was accomplished using Statistical Package for Social Sciences (SPSS). To determine the reliability of determinants, reliability analysis is accomplished on each determinant using Cronbach's Alpha Index. The determinants are said to be reliable if they have reliability score greater than 0.70. The results of the study are shown below:

Determinant	No. of Items	Cronbach's Alpha	Mean
Attribute Capabilities	6	0.738	2.07 6
Perceived Risks	6	0.722	3.84 3
Perceived Benefits	7	0.804	2.07 6
Viability of Implementation	9	0.827	2.27 4

Table 1: Showing the results of Cronbach's Alpha Index

From the above reliability test table, it can be concluded that each determinant is reliable as the score is greater than 0.70.

Regression test is conducted to test the Hypothesis. The value of significance is provided by model summary table. It indicates whether the model as a whole is significant. The F-statistic is said to be significant if its value is less than criteria alpha level ($p=0.05$); The alpha level of 0.05 suggests 95% of confidence in ability of dependent variable to explain the model. Thus, is F value being less than alpha value one can conclude that regression model built is statistically significant. The model summary of the regression analysis conducted is as follows:

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.528 ^a	.279	.256	.7572	.279	12.371	1	32	.001

a. Predictors: (Constant), Please rate the following attributes which telecom companies possess that help them to profit from blockchain implementation (Partnership ecosystem)

b. Dependent Variable: On a scale of 1-5 is there a benefit (in terms of revenue) of implementing blockchain in telecom companies?

Table 2: Model Summary

Model Summary ^b									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.564 ^a	.318	.297	.7364	.318	14.909	1	32	.001

a. Predictors: (Constant), What are the benefits according to you can be obtained by telecom companies implementing blockchain? Please rate the benefits in scale of 1-5. [Better transaction speed]

b. Dependent Variable: On a scale of 1-5 is there a benefit (in terms of revenue) of implementing blockchain in telecom companies?

Table 3: Model Summary

Model Summary ^b									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.367 ^a	.135	.108	.7547	.135	4.976	1	32	.033

Table 4: Model Summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.430 ^a	.185	.160	.7323	.185	7.270	1	32	.011

a. Predictors: (Constant), What are biggest challenges for telecom companies to implement the blockchain technology? Please rate the challenges accordingly (Governance Challenges)

Table 5: Model Summary

Studying the tables, it can conclude that the hypotheses are statistically significant. Attribute capability of a telecom company to implement blockchain technology is a significant factor in revenue generation (H1 Proved from Table 2). Risk Perceived in implementing blockchain technology is a significant factor in revenue generation in telecom company (H2 proved from Table 3).

Perceived Benefits in implementing blockchain is a significant factor in revenue generation in a telecom company (H3 Proved from Table 4). Viability of implementing a blockchain technology is a significant factor in revenue generation in a telecom company (H4 Proved from Table 5).

Exploratory factor analysis performed on collected primary data from respondents provided a clear picture of different revenue data models which can be termed as follows:

(i) Low Risk Revenue Model

The low risk revenue model is characterised by using blockchain for lowering the operational costs, utilise for increasing the transaction speed, automation of business and constrained by limited market of blockchain. These inherently mean usage of Blockchain for intrinsic purposes of a telecom company.

(ii) Viable Revenue Model

The viable revenue model is characterized by implementing those blockchain use-cases which are most viable. These use-cases include smart bandwidth monitoring, prototyping and use case development for third parties and Enterprise services. These are proven use cases which can be implemented by telecom companies.

(iii) Attribute Based Model

Taking consideration, the attributes, and capabilities of Indian Telecom companies a revenue model can be constructed based on Ideation, Business Model Flexibility and Trust of consumers.

The factor scores and pattern matrix can be seen below:

(i) The total variance table below shows that four models cover more than 50% of the variance.

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	5.492	18.938	18.938	5.492	18.938	18.938	3.258
2	3.969	13.686	32.624	3.969	13.686	32.624	2.992
3	3.348	11.544	44.169	3.348	11.544	44.169	3.121
4	3.055	10.534	54.703	3.055	10.534	54.703	3.447

Table 6: Total Variance Explained

(ii) Pattern Matrix Table

The pattern matrix table provide the clear indication of underlying patterns with respect to factor loading scores

Pattern Matrix*										
	Component									
	1	2	3	4	5	6	7	8	9	10
What are the benefits according to you can be obtained by telecom companies implementing blockchain? Please rate the benefits in scale of 1-5. (Time Saving (Reduced time for finding information, verifying transactions, Bill Settlements etc))	.822									
Please rate the following attributes which telecom companies posses that help them to profit from blockchain implementation (Customer Reach)	.694									
What are the benefits according to you can be obtained by telecom companies implementing blockchain? Please rate the benefits in scale of 1-5. (Enabling new	.679					.521				

Table 7: Pattern Matrix Table

(iii) The Correlation Matrix

The correlation matrix shows that the components selected are not orthogonal and thus oblimin rotation can be used

Component Correlation Matrix										
Component	1	2	3	4	5	6	7	8	9	10
1	1.000	-.004	-.111	.099	.114	.043	-.152	.037	.170	.110
2	-.004	1.000	.084	.184	-.029	.062	-.018	.113	-.057	-.161
3	-.111	.084	1.000	.115	.007	-.005	.167	.198	-.028	.056
4	.099	.184	.115	1.000	-.118	-.088	.054	.089	-.118	.006
5	.114	-.029	.007	-.118	1.000	.127	-.044	.032	.127	.088
6	.043	.062	-.005	-.088	.127	1.000	-.065	.003	.132	-.132
7	-.152	-.018	.167	.054	-.044	-.065	1.000	.062	-.136	.028
8	.037	.113	.198	.089	.032	.003	.062	1.000	.071	.074
9	.170	-.057	-.028	-.118	.127	.132	-.136	.071	1.000	.049
10	.110	-.161	.056	.006	.088	-.132	.028	.074	.049	1.000

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Table 8: Correlation Matrix Table

6. Managerial Implications

This study will benefit Telecom Operators in India to increase their revenue implementing blockchain Technology. Any of the models suggested can be used depending on the risk appetite and return which is being aimed by the organization. Low risk revenue model suggest Blockchain can be implemented only for the internal organizational purpose for increasing its operational efficiency. Results show that more than 50% of the departments have already implemented Blockchain in their organizations and other 20% are seriously looking for use-cases which can be implemented. Around 35% of respondents are confident that Blockchain can help to revive the Telecom Industry. Thus, there is a strong positive outlook towards implementation of Blockchain for revenue generation. These new insights offered can help telecom companies to tailor make their revenue models depending on one’s requirement making these baseline models as a framework or strategy tool.

7. Conclusion

The objective of this paper is to propose revenue models which can be beneficial to Indian Telecom companies. Three models are proposed, viz. Low Risk Revenue Model, Attribute based model and Viability based model. These models are proposed taking into consideration of risks perceived by implementing blockchain, the capabilities telecom companies possess to build their blockchain enabled technology services and the viability of implementation. Most importantly risks like Governance challenges are considered while proposing the revenue model. Most of the companies are looking for a legal and procedural framework for implementing Blockchain and affirm that standardization can help in quick adoption of the technology. The data analysis showed that there is a strong optimistic outlook towards blockchain enabled technology and majority deem that this technology is living up to its hype and foresee benefit offered by implementing Blockchain in Indian Telecom companies.

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