

The Affecting Factors of Blockchain Technology Adoption of Payments Systems in Indonesia Banking Industry

Rohmat Taufiq
*Computer Science Department,
 BINUS Graduate Program - Doctor of Computer Science
 Bina Nusantara University
 Jakarta, Indonesia 11480,
 Informatic Engineering, Engineering Faculty,
 University Muhammadiyah of Tangerang
 Tangerang, Indonesia 15117
 rohmat.taufiq@binus.ac.id,
 rohmat.taufiq@umt.ac.ic*

Meyliana
*Information Systems Department,
 School of Information Systems
 Bina Nusantara University
 Jakarta, Indonesia 11480
 meyliana@binus.edu*

Achmad Nizar Hidayanto
*Faculty of Computer Science
 University of Indonesia
 Depok, Indonesia 16424
 nizar@cs.ui.ac.id*

Harjanto Prabowo
*Management Department,
 BINUS Business School Undergraduate Program
 Bina Nusantara University
 Jakarta, Indonesia 11480
 harprabowo@binus.edu*

Abstract—The purpose of this study is to find the influence factors of blockchain technology adoption of payments system in Indonesia banking industry. Moreover, the researchers proposed new model of payment system by using blockchain technology in Indonesia banking industry. All this time, the researchers of blockchain in payment systems were done in major countries such as UK, USA, Australia, Scotland, Germany, Japan, France, Italy, and China. Systematic Literature Review (SLR) used as a method in this study and there were five databases that taken as references, such as IEEE, Science direct, AIS electronic, ACM and Google Scholar. The researchers were found 26 references Studies Included in Quantitative Synthesis and 9 variables (Easy to use, Usefulness, Transaction fees, Risk perception, Behaviour intention of use, Attitude toward, Cognitive style, Subjective Norm, Effectiveness). Based on the result of data analysis and discussion, there were two conclusions in this study, the first, the researchers found nine factors that expected to be used as a reference if Indonesia banking industry wants to adopt blockchain technology for payment system; and second, the researchers had to propose payment system model by using blockchain technology in Indonesia banking industry.

Keywords—*affecting, adoption, blockchain, payment systems, banking industry, Systematic Literature Review (SLR)*

I. INTRODUCTION

Recently, a new technology that has attracted attention because it is considered to have an innovative that is claimed to be able to change the future, which has emerged new thinking from the financial market side. World Economic Forum (WEF), which in 2016 has suspected that blockchain

technology will be able to revolutionize financial services in the banking world by creating a platform that connects consumers and producers directly. In addition, “blockchain technology is included in the top 10 new technologies given to the United Nations “[1].

Blockchain technology is a technology developed to be used to support Bitcoin, generally known as cryptocurrency. “Blockchain technology has become popular and very famous in the banking world. to date individually or organization can benefit from blockchain technology in its ability to secure data exchange and to make transactions simpler and easier between entities “[2]. In recent years many factors will disrupt or affect the business model (BM), while blockchain technology has sparked a debate among scientists and researchers. using Delphi model, we discovered and defined the impact of blockchain in payments, which is the basis of the banking world and the beginning of the birth of this technology [3].

“Blockchain is a distributed database that starts with Bitcoin introduced, which keeps records of every transaction recorded continuously and continuously using the hash function in the blockchain “[4]. Almost all societies generally demand transparency in public administration across the country in the world and ask for a new technology to be developed to improve management capacity within an organization, and to request good control and maximize governance. one of the new technologies that could potentially be used in organizations free of corruption is blockchain. [5].

Blockchain technology is a new technology using open ledger or distributed ledger methods stored in a chain (block)

in a general ledger that can be seen by all members of the block. "Blockchain with decentralized methods is a new innovation, using open database transactions. with open or decentralized data bases it is expected that security and trust can be safeguarded. if viewed from the economic side then decentralized is a new tool or new technology that can be relied upon "[6].

"All this time, the researches of blockchain in payment systems were done in major countries such as UK, USA, Australia, Scotland, Germany, Japan, France, Italy, China, etc and they were also actually conducted such researches for developing countries." Therefore, Yoo said that "some of the world's major economies are investing heavily in the blockchain sector by increasing the amount of funds spent on research on blockchain technology "[1]. Besides, according to Kshetri "the cost to spend the Blockchain research as always increases, for example in VC-backed investments in blockchain totalled US\$3 million in 2011, US\$474 million in 2015 and US\$2.5 billion in 2016" [19].

The research in German explained of Impact of Blockchain technology on Business Models (BMs) in the payments industry consist of 10 sub criteria in 4 criteria: 1. Blockchain-enabled services (New services with blockchain technology (BT), Obsolete services with BT, P2P and direct transactions, Cross-border and cross-curently, Connection between contract and transaction). 2. Changed Financial Structure (Change income structure, Cost reduction). 3. Potential for BMs (New BMs in payments, Obsolete BM in payments). 4. New market players (Fintech developing BT)[3]. The other of research in Hawaii USA conference found blockchain adoption in 3 criteria and 6 sub criteria, such as: "1. Organizational (Digital payment platforms, Network effects, New business models); 2. Related to the competitive environment (Actors in the financial industry, Consumers payment behaviour); and 3. Technology design "[6].

The previous research in Swiss explained the benefit of using blockchain of payment system are "easy to use, privacy, low transaction fees, micro transactions, irreversibility and alternative store of value "[24]. The other research in New Castle University explained "the various impacts of blockchain application in Inherent field (access, 'Double spending', security, anonymity, limited supply); Economic (Transaction volume, transaction fees, price and volatility); Trust; Regulation; Innovation (Disruptive, Open) "[23]. The researchers present early evidence linking the use of blockchain in overcoming some economic, social and political challenges facing the Global South in Korea. The article highlights the key applications and uses of blockchain in developing countries. "It demonstrates how blockchain can help promote transparency, build trust and reputation, and enhance efficiency in transactions [1]."

In Indonesia itself, it is still hard to find the research about influence factors of blockchain technology adoption of payment system in banking.

In other hand, the objectives of this study are the researchers would find the influence factors of blockchain technology adoption of payments system in Indonesia banking industry and they would propose new model of payment system by using blockchain technology that could be apply as

reference for adopting blockchain technology of payment system in Indonesia banking industry.

II. RESEARCH METHOD

The study was arranged due to the researchers found that there has a through study literature review on the research about the affecting factors of blockchain technology adoption in payment system. Process of this research is divided into some part as follow: (1) specifying of research source; (2) defining the pattern of keyword for searching process of the research; (3) starting for doing of inclusion and exclusion of criteria in the research; (4) extracting data of the research; and (5) analysing the data finding to answer the search question, (6) proposing new model of payment system by using blockchain technology.

The research question is 'What are the affecting factors of blockchain technology adoption of payments systems in the banking industry?' and the objectives of the study are to find the influence factors of adoption blockchain technology of payments systems in the banking industry and make new model of payment system by using blockchain technology.

A. Process of the Research

The first process is specifying of research source in literature to find some previous researches in articles or journals that suitable with this research. Moreover, the researchers selected sources for systematic literature review as follows:

1. IEEE (<https://ieeexplore.ieee.org>)
2. Science Direct (<https://www.sciencedirect.com>)
3. AIS EL (<http://aisel.aisnet.org>)
4. ACM (<http://acm.org>)
5. Google Scholar (<http://google.scolar.com/>)

The search process in 5 databases is done by using a combination of keywords ('factor' and 'influence' and 'adoption') or ('blockchain' and 'technology' and 'payment' and 'system'). The operators used are (OR and AND). hope to be achieved with these keywords in order to get research that has a significant relationship with the title used. Big hope to be achieve it can answer the research question in this research.

The first step is doing search process above got 488.948 studies found. after done studies found the next step is to do record screening and got 73 papers that have something to do with the theme taken. from the next step that is done is assessed for eligibility found 37 papers. the last step with studies included in quantitative synthesis and found 26 papers. of these 26 papers are further referred to as this research.

This study would be keep as "Candidate Studies" when the title and abstract were appropriate and match to define the research question. After that, the researchers would refine these previous researches and

From the 37 papers that have been used the step is reading and studying thoroughly to answer the existing research questions. And in the last step will be determined "Selected Studies", if they were appropriate to answer the research question.

Based on the researchers experienced when we want to clarify the validity of research paper, the exclusion criteria of

searching the previous researches were defined into some procedures as follows:

- From 2011 to 2018 the paper used as a reference in this study
- The paper used was complete. In other hand all identities (journal/conference, identity of author, etc) are mentioned in the paper.
- the same paper title has been discarded and not used in the SLR

B. Data Extraction

The research used 5 databases, was examined 488.948 in the Studies found. The record screening had 73 found from all resources and criteria. From 73 record screening, there were 37 papers which had been to assess for eligibility. After studying 37 papers that have been downloaded, there are 26 papers that have a very significant relationship with this research.

TABLE I. STUDIES INCLUDED IN QS

Source	Studies found	Record Screening	Assessed for Eligibility	Studies Included in Quantitative Synthesis
1. IEEE	5	5	3	3
2. Science Direct	26	4	2	2
3. AISel	24	3	3	2
4. ACM	485.323 3570	20 41	11 18	8 11
5. Google Scholar				
Total	488.948	73	37	26

III. RESULTS OF DATA ANALYSIS AND DISCUSSION

This study was intended to investigate the components of the affecting factors of blockchain technology adoption in payment system. With using blockchain technology in the payment process will have a great opportunity although the challenge also persists. What criteria will influence the adoption of blockchain technology in terms of payment processing in the banking world. of the question then it is researched in this SLR to get any criteria that may influence the adoption of blockchain in terms of payment systems. The steps taken in the search source is by grouping the source of publication, publication year, variables used, of these variables appear the existing components in each variable and the last is to determine the existing indicators.

The results of resource publication are elaborated as follows.

TABLE II. SOURCE OF PUBLICATION

No	Title	Years	Type
1	Blockchain ... [1]	2017	J
2	Cryptocurrency ... [2]	2018	C
3	The Impact ... [3]	2017	C
4	Financial ... [4]	2018	B
5	The uses of ... [5]	2014	C
6	Opportunities ... [6]	2017	C
7	Using data ... [7]	2013	C

8	Influence ... [8]	2016	C
9	Exploring ... [9]	2011	C
10	Can crypto ... [10]	2018	J
11	Blockchain ... [11]	2016	C
12	Blockchain ... [12]	2018	C
13	Why Payment ... [13]	2014	J
14	Decentralized ... [14]	2018	C
15	Using ... [15]	2016	C
16	Basic ... [16]	2017	C
17	Analysis ... [17]	2018	RR
18	Trend ... [18]	2015	J
19	Will Blockchain ... [19]	2017	J
20	A Structured ... [20]	2018	C
21	Mobil Money ... [21]	2016	RR
22	Prospect ... [22]	2017	RR
23	The future ... [23]	2017	RR
24	Blockchain ... [24]	2016	RR
25	The Payment ... [25]	2018	J
26	The Acceptance ... [26]	2016	C

Number of authors when viewed from the author's department group from computer science and engineering reach (46%) and the other of authors discipline of experts can be seen in the following Table 3. Therefore, it can be summarized that blockchain technology in payment system is multidisciplinary concept between computer sciences and engineering, economic and management, business administration, financial and management, etc.

Technology and social media was evolving so fast moreover they could be drove this research to find the component framework for adoption blockchain technology to support payments system in the banking industry.

Based on the result, there were 9 variables of affective factor adopting of blockchain technology in payment system from 26 literatures; that can be used as a standard to adoption blockchain technology in payment systems.

Table 4 shows the classification of indicator (variable, component and indicator) is defined.

TABLE III. LIST OF AUTHORS DISCIPLINE OF EXPERT

No	Discipline	#	%
1.	Computer Science and Engineering	27	46
2.	Economics and Management	11	19
3.	Business Administration	8	14
4.	Finance & Management,	7	12
5.	Centre on Capitalism and Society	1	2
6.	International Department	1	2
7.	Art department	1	2
8.	education and training	1	2
9.	Editorial department	1	2
10.	Mass Communication	1	2
Total		59	100

TABLE IV. THE CLASSIFICATION OF INDICATOR

No	Variable	Component	Indicator
1.	Easy use [7] [8] [9] [4] [3] [6] [24]	Individual adopts this new technology [7]	they know how to use it and because it makes their life less complex [7]
2.	Usefulness [7] [8] [9]	- Perceived Ease of Use - Behaviour Intention [9]	it is convenient, suitable and time saving [7]
3.	Transaction fees	The transaction fees	cost advantage [7]

	[7] [4] [25] [24] [23]	infer [7] [3]	
4.	Risk perception [7] [4] [2] [25] [24] [23]	Implement and maintenance [25] security of transactions [9] Privacy, Security and Risk [25]	feel comfortable and be at ease while using it [7] Data held securely, and privacy [25]
5.	Behaviour intention of use [8] [9] [4] [6]	- Uncertainty Avoidance	- Perceived risk
6.	Attitude toward [8]	- Individualism [9] performing the target behaviour [8]	- respect [9] Individuals positive or negative feeling about performing the target behaviour [8]
7.	Cognitive style [8]	- Attitudes - Values - Social interaction thinks - Solve problem - Learn - Related [8]	individual's choice based on cognitive functioning [8]
No	Variable	Component	Indicator
8.	Subjective Norm [9]	- societal norm - social influence [9]	- large circle of influence - small circle of influence [9]
9.	Effectiveness [4] [25]	- quality of service - efficiency [25]	have a regulation which is flexible enough to allow for quality and efficiency [25]

Table 4 explains 9 affecting factors or 9 variables and 30 references of source which divided as follows: 1. Easy to use (7 references), 2. Usefulness (3 references), 3. Transaction fees (5 references), 4. Risk perception (6 references), 5. Behaviour intention of use (4 references), 6. Attitude toward (1 reference), 7. Cognitive style (1 reference), 8. Subjective norm (1 reference) and 9. Effectiveness (2 references). In each variables have some components and indicators.

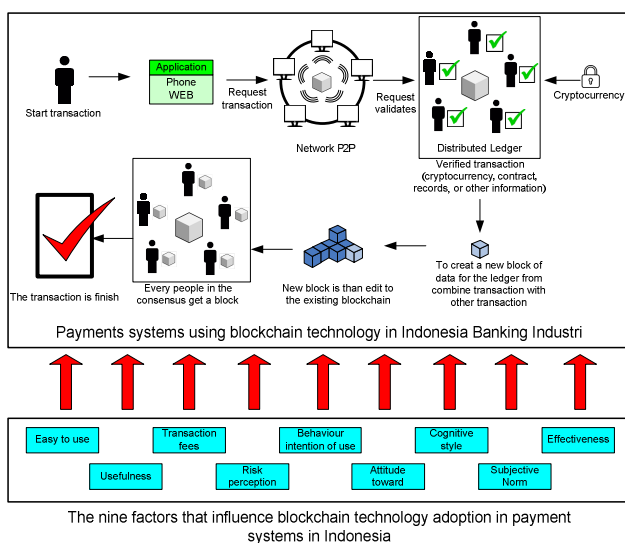


Fig. 1. Proposed Blockchain Application Model of Payment System in Indonesia Banking Industry

In Figure 1 is a propose model. It explained the 9 factors that influence of blockchain technology adoption of payment system in Indonesia banking. The nine factors have taken as foundation to adopt blockchain technology in payment system. It can be hope the application of payment system in banking will give the freshness and belief to users due to security, speed of transfer, cheap of cost, and decentralized ledger.

The payment process that have done by using blockchain technology is started from someone who requested transaction by using Phone application or WEB that delivered to Network P2P and after that Network P2P system asked consensus to verify, after it verified then it made a new block that contain are cryptocurrency, contract, record, or other information. The next step, that block saved as one with other blocks. After they saved, every singles of consensus will get copy in each transaction. If the steps have done then the transaction process is completed.

IV. CONCLUSION AND IMPLICATIONS

Distributed ledger method in blockchain technology are the key to the success of the latest developments in payment systems in the banking industry. It was existed with variables as a reference to adopt blockchain technology for the needs of payment systems in the banking industry. All this time the researches of blockchain in payment systems were done in major countries such as UK, USA, Australia, Scotland, Germany, Japan, France, Italy, China. They have done in major countries such researches for developing countries. The fund that spent for blockchain technology research is always increases. Based on the data, the total fund for this research was US\$3 million in 2011 increased to US\$2.5 billion in 2016. Moreover, in this study also have made payments systems model by using blockchain technology in Indonesia banking industry that influence by nine factors or variables that could be apply as reference for Indonesian Banking for blockchain adoption in payments systems.

This research had two major theoretical implications and practical implications. As a theory there were 9 variables to serve as an excuse to adopt blockchain technology of payment systems in Indonesia banking industry. Based on the result, the advantages of using blockchain technology of payments system in banking industry as follows: easy to use, privacy, low transaction fees, real time, need a fast time and efficient. These advantages can be used to competitive advantage in the banking industry.

V. LIMITATION AND FUTURE RESEARCH

Some of the limitation that have been collected in this study are: first, the number of data base 5 so that the information obtained can still be optimized if using more than 5 databases. Second, it used one keyword better if it used more than one keyword to get a similar title or almost the same title. Third, the number of references was in little used. Fourth, 9 components used have not been tested statistically so its validity and reliability have not been calculated.

The next research that must be done to develop this research are: increasing the number of databases so that can get more references so that it can expand the content of this research, using more than the expected keyword can get the number of studies that have a closer correlation, and required validity test and the reliability of 9 components already obtained.

REFERENCES

- [1] Yoo, S. "Blockchain based financial case analysis and its implications". *Asia Pacific Journal of Innovation and Entrepreneurship* Vol. 11 No. 3, 2017. pp. 312-321.
- [2] Schaupp, L.C. and Festa, M. "Cryptocurrency Adoption and the Road to Regulation". *Association for Computing Machinery*. ACM ISBN 978-1-4503. Delft, Netherlands -18, May 30-June 1, 2018.
- [3] Holotiuik, F. Pisani, F. and Moormann, Jürgen. "The Impact of Blockchain Technology on Business Models in the Payments Industry". *13th International Conference on Wirtschaftsinformatik*, St. Gallen, Switzerland, February 12-15, 2017.
- [4] Sapovadia, V(2018). "Financial Inclusion, Digital Currency, and Mobile Technology". *Handbook of Blockchain, Digital Finance, and Inclusion*, Volume 2. ISBN: 978-0-12-812282-2. Copyright Elsevier Inc. All rights reserved. 2018.
- [5] De Souza, R. C, Luciano, E.M. and Wiedenhof, G. C. "The uses of the Blockchain Smart Contracts to reduce the levels of corruption: Some preliminary thoughts". *Conference: the 19th Annual International Conference*. In *Proceedings of dg.o*. Delft, Netherlands '18, May 30-June 1, 2018.
- [6] Lindman, J. Rossi, M. and Tuunainen. V.K. "Opportunities and risks of Blockchain Technologies in payments– a research agenda". *Proceedings of the 50th Hawaii International Conference on System Sciences*. ISBN: 978-0-9981331-0-2. 2017
- [7] Berrado, A. Elfahli, Sand El Garah, W. "Using Data Mining techniques to investigate the factors influencing Mobile Payment adoption in Morocco". *8th International Conference on Intelligent Systems: Theories and Applications (SITA)*. 2013.
- [8] Hossain, R and Mahmud, I. "Influence of cognitive style on mobile payment system adoption: An Extended Technology Acceptance Model". *International Conference on Computer Communication and Informatics (ICCCI-2016)*, Jan. 07 – 09, 2016, Coimbatore, INDIA
- [9] Zhang, A. Yue X and Kong, Y. "Exploring Culture Factors Affecting the Adoption of Mobile Payment". *10th International Conference on Mobile Business*. 2011. DOI: 10.1109/ICMB.2011.32.
- [10] Ammous, S. "Can cryptocurrencies fulfil the functions of money?". *Quarterly Review of Economics and Finance* (2018).
- [11] Yamada, Y. Nakajima, T. and Sakamoto, Mizuki S. "Blockchain-LI: A Study on Implementing Activity-Based Micro-Pricing using Cryptocurrency Technologies". *MoMM '16*, November 28-30, 2016, © 2016 ACM. Singapore, Singapore.
- [12] Narayanan, A. "Blockchains: Past, Present and Future". 2018 Copyright is held by the owner/author(s). Publication rights licensed to ACM.
- [13] Anderson, R and Murdoch, S. J. "Inside Risks EMV: Why Payment Systems Fail". *Communication of the ACM* June 2014 Vol. 57 No. 6
- [14] Dukkupati, C. Zhang, Y and Cheng, L. C. "Decentralized, Blockchain Based Access Control Framework for the Heterogeneous Internet of Things". *ABAC'18*, March 21, 2018, Tempe, AZ, USA.
- [15] Lin, J, Shen, Z and Miao, C. "Using Blockchain Technology to Build Trust in Sharing LoRaWANIoT". *Science and Engineering*, Beijing, China, July 6-9, 2017 (ICCSE'17)
- [16] Garay, J. A. "Basic Properties of the Blockchain". *BCC* 2017, April 2, Abu-Dhabi. ACM ISBN 978-1-4503-4335-0/17/02.
- [17] Parino, F. Beiro, M. G and Gauvin, L. "Analysis of the Bitcoin blockchain: Socio-economic factors behind the adoption". *Cornell University Library*. 2018.
- [18] Peters, G. W. Panayit, E and Chapellet, A. "Trends in cryptocurrencies and blockchain technologies: A monetary theory and regulation perspective". *Journal of Financial Perspectives* is currently edited by Ms Alina Stefan. 2015.
- [19] Kshetri, N. "Will blockchain emerge as a tool to break the poverty chain in the Global South?". *Third World Quarterly* 2017.
- [20] Salviotti, G. Rossi, L. M. D and Abbatemarco, N. "A Structured Framework to Assess the Business Application Landscape of Blockchain Technologies". *Proceedings of the 51st Hawaii International Conference on System Sciences* 2018.
- [21] Sherier, D. Canele, G and Pentland, A. "Mobile Money & Payments: Technology Trends". *connection.mit.edu*. 2016.
- [22] Williams, R. C. "Prospects for blockchain-based settlement frameworks as a resolution to the threat of de-risking to Caribbean financial systems". *Economic Commission for Latin America and the Caribbean (ECLAC)*. 2017.
- [23] Pust, L. "The future of money: How Bitcoin and its underlying Blockchain technology could affect the financial sector". *Newcastle university Business School*. 2017.
- [24] Jaag, C and Bach, C. "Blockchain Technology and Cryptocurrencies: Opportunities for Postal Financial Services". *Swiss Economics Working Paper* 0056. August 2016
- [25] Románova, I. Grima, S, Spiteri, J and Kudinska, M. "The Payment Services Directive 2 and Competitiveness: The Perspective of European Fintech Companies". *European Research Studies Journal* Volume XXI, Issue 2, 2018
- [26] Schuster, O. Falkenrech, C and Wagner, R. "The acceptance of mobile payments in the german retail market". *International academic conference fourth edition 2016 buchares* October 20-21.