BLOCKCHAIN IMPLEMENTATION AND PRINCIPAL-AGENT THEORY

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Abstract
One of the biggest issues in organization in centuries is problem raised by the relationship between actor inside. This problem called principal-agent problem which explained by principal agent theory (PAT). The emerged new technology disruption called blockchain technology (BCT) receive the challenge to offers the solution for principal-agent problem, it claims empirically could reduce or even eliminate the problem, thus lead to lower cost to solved the problem, called agency cost. This technology application wide spread in several sectors, the example is the implementation of Decentralized Autonomous Organization (DAO). DAO is the blockchain based new form of organization, who run based on a smart contract or algorithm run in the computer network. This paper is conceptual paper, we explained about the basic of blockchain, and we analyzed the correlation between blockchain and principal agent theory.
Keywords: blockchain, principal-agent theory, decentralized autonomous organization, agency cost
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1. INTRODUCTION

Blockchain considered as new technology which have ability to disrupt and reshaping industry in the future (Clohessy & Acton, 2019). Blockchain got attention from many industries since its born. Even though the company acknowledges the hype surrounding the technology, they are still skeptical about adopting it for actual value for company (Kar & Navin, 2021). Blockchain projected becomes the latest revolutionary technology and need attention from academics and practitioners. Blockchain basically distributed and have database that could change and allows transactions will be more efficient and transparent. Analysis about blockchain extends to many field and topics, including to organization theory, transaction cost theory and supply chain topics. Blockchain allegedly could reduce transactions cost and improve governance organization, allow transparent and valid transactions (Schmidt & Wagner, 2019). It also referred to as Distributed Ledger Technology (DLT), was originally created as a platform technology to enable Bitcoin. Bitcoin and similar digital currencies are issued and managed by anonymous participants (partners) around the world. Even though blockchain is developed for activate

Bitcoin, there is perception that development technology has allow blockchain for work as a computing platform that delivers code device soft by decentralized network, finally work as computer "network" or "decentralized". Blockchain have the ability to influence and change the role of intermediary service or third party service such as bank, digital currency, structure of organization, data management, micro transactions, and new industry (Takagi, 2017). Regardless from all promising advantages from this new technology, for many people, blockchain technology is still becoming a mysterious topic. A number of people having skepticism about using this technology in the future. This phenomenon easy to understand because blockchain still in the early stage of development and adoption.

Blockchain adoption can radically disrupt how we communicate with consumer, the way we manage marketing mix and marketing programs in the holistic marketing, blockchain can negate third party role, and in every day financial practice, it is possible for consumer to transfer money to the other party without cost and real time. Consumer can keep money in online wallets that are not bound with a bank, they can have their own bank. Consumer no need bank permit for access or to transfer the money, and eliminate worrying third party hacking, or government policy manipulation (BlockGeeks, 2016). Blockchain implementation describe an efficient and low-cost transaction in the future, similar with the goal of organization to maximize profit and minimize cost, and resolved any problem arise within an organization. One big issue in blockchain implementation in organization is the implementation of Decentralized Autonomous Organization (DAO), a new concept of organization who will disrupt the existing conventional organization and have a chance to eliminate principal-agent problems, this case is related to principal-agent theory (Treiblmaier, 2018). This paper will discuss the impact of blockchain technology to organizations structure and its relation with principal-agent theory, especially the connection with Decentralized Autonomous Organization (DAO). This paper writes in five-part, first part is introduction that gives description about blockchain, section two will explained briefly about previous literature that explained about blockchain and its relation with theory organization, in particular the principal-agent theory. Next section is methodology, section four will be discuss about blockchain link with principal-agent theory and blockchain application in Decentralized Autonomous Organization (DAO), final section is conclusion.

2. LITERATURE REVIEW

2.1 Blockchain

Blockchain was introduced for the first time in 2008 by the anonymous founder of Bitcoin who goes by the pseudonym "Satoshi Nakamoto" in the writing titled " Bitcoin: A Peer-to-Peer Electronic Cash System" (Nakamoto, 2008). Nakamoto proposed transaction electronic peer-to-peer basis depend on

trust and record history in public transactions. In the digital economy, trust is basic thing in trading sector, without transaction trusts between agent economies spread all over the world are not Possible walk effective. From the science perspective, Economy or trust propose new discussion in digital economy and institutional economy to rethinking about money concept, trust, contract in business and economy. Basically, a blockchain is a distributed, transactional database (Glaser, 2017). Blockchain combines the principles of cryptography, peer-to-peer networking, and game theory. Blockchain evolved to track the database underlying the cryptocurrency, i.e., bitcoin, until recently referred as a distributed ledger with software algorithms to record transactions as a block chain with trust and anonymity. Blockchain also uses the concept of smart contracts where business rules are implied by agreements embedded in the blockchain and executed by transactions (Laroiya et al., 2020). Although it has been around for more than 10 years, blockchain recently known for public, most people did not recognize that new technology developed around them, and a shifting in financial technology is happening. The technology was initially started with great skepticism, because of this, companies are starting to seek the potential of the technology to improve their performance. This interest was confirmed in a recent PWC survey where 84% of respondents reported being actively involved in blockchain (Gammelgaard et al., 2019).

Bitcoin was originally developed to create a distributed digital currency without a central authority. Blockchain technology is the backbone of Bitcoin, which uses cryptography to to transfer digital money. Blockchain is one of the technologies that underlies Bitcoin. Bitcoin is the most popular example that is intrinsically tied to blockchain technology (Crosby et al., 2016). There is an argument that blockchain is the only technology behind Bitcoin. However, Bitcoin has been created using various other cryptographic technologies combined with blockchain (Raharjo, 2010). Estimated blockchain market size grow from US$210.2 million in 2016 to US $2,312.5 million in 2021, with level growth annual combined by 61.5 percent (Markets & Markets, 2016).

Definition related to blockchain has been discussed by many researchers, however there is no consensus that states a single definition. Blockchain can be described as a (distributed) ledger or, more simply, a chronological database of transactions recorded by a network of computers (Avdzha, 2017). Blockchain basically is a back-end database (digital ledger) which is distributed among all respective database users have their own copy of the ledger (Gammelgaard et al., 2019). Ben Wizner (2018) explain that blockchain is one of the database type (system data storage) consist of a series of block containing digital information. Each block has component called Hash (Hash is a character set that composes various information on the block). Blockchain consists of two constituents components, that is Block (group) and Chain (Chain), all information on the computer divided into a number of block and mutual connected with the chain (Wizner, 2018). Blockchain also can depicted as decentralized,

transactional database technology that facilitates validated and consistent transactions and robust, across the participant network called nodes (Glaser, 2017). Blockchain is also defined as a digital, decentralized and distributed ledger in which transactions are logged and added in chronological order with the goal of creating permanent and tamperproof records (Treiblmaier, 2018). Treiblmaier also described that Decentralization refers to a situation where no there is entity single controlling, processing transaction then distribution related with profession shared computing, among a number of computers. Distributed Ledger Technology (DLT) is a broad term which describes all technologies that distribute information across multiple sites, countries or institutions and which includes the blockchain. Each transaction in the public ledger is verified by consensus of a majority of the participants in the system. Once entered, information can never be erased (Crosby et al., 2016).

Several literatures define basic characteristics of Blockchain (Avdzha, 2017; Lorne et al., 2018; Zheng et al., 2018), from the litertures we identified the main features of blockchain are:

1. Privacy: As a built-in function in a platform, users (nodes) are never identified publicly while all transactions are completely transparent and traceable.

2. Immutability: No modification can be done to a fully processed transaction;

3. Standardized rules: Identical rules are to be followed in every transaction contributing in the foundational basis for "smart contracts".

4. Distributed: All transactions can be seen on a distributed database; they can be validated by every partaking nodes contingent on the uniform rules

5. Decentralized: No more space for the trust element, no more "central authority" to verify each transaction.

Blockchain implementation as a technology platform for currency already start to implement Smart Contract, for example is Ethereum. Smart Contract is agreement between two or more parties who made contract that can created automatically without intermediary (Savelyev, 2017; Treiblmaier, 2018). Other researcher define smart contract as an agreement whose execution is automated usually through 'a computer running code that has translated legal prose into an executable program' (Avdzha, 2017). How blockchain works explained in Figure 1.
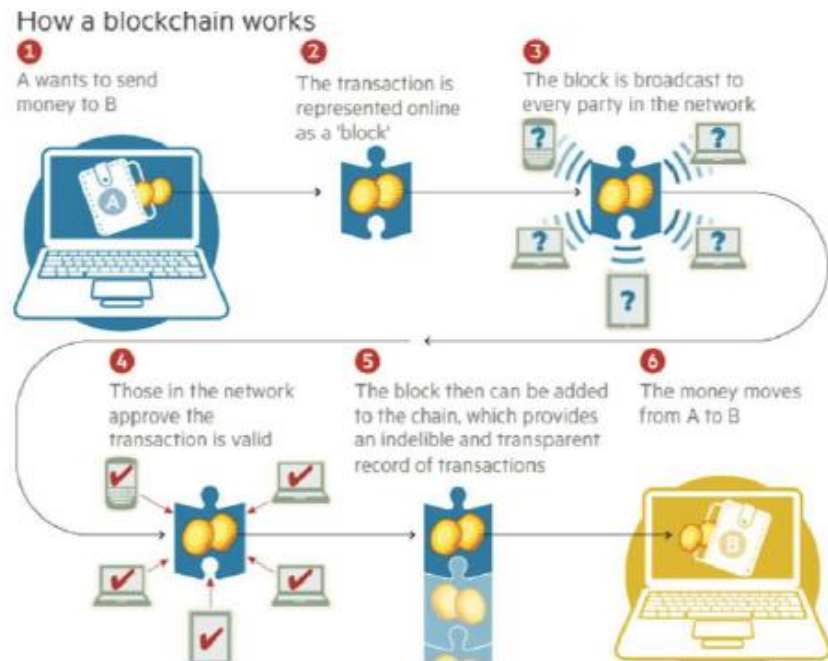
FIGURE 1. HOW BLOCKCHAIN WORKS

Source: Crosby et al., 2016.

Rising of the blockchain implementation in many topics related with supply chain management, financial and structure organization. In finance Industry, blockchain implementation can found in a number of example such as , Trade Finance - Companies use BCT to replace credit agreement; cross border payments, technology with blockchain is distributed ledger where the bank has use for make international payment more simple and fast, safe and can be trusted; FX Trading - various recorded trading deleted and served view together for then leads to reconciliation sustainable in various system; Capital market operations - BCT plays vital role in every trade step, offers a transparency and verification on company center and reduce scoping credit; Know your customer - this process needs many times for collect and upload data individually in the system. BCT saves the data in storage center and produce number references shared between all banks and institutions financial almost in real time (Laroiya et al., 2020) . In the manufacturing, SCM, and logistics industries the merger of the internet of things (IoT) and blockchain has potential, for example, for activate connected vehicles that are automatically, the blockchain platform can also use for application SC tracking that saves registry formal product and can track ownership goods at different stages in chain. In discussion associated supply chain developments with theory organization in company , often linked in a number of theory like the principal-agent theory, transaction cost analysis, the network theory and resource-based view (Halldorsson et al., 2007; Treiblmaier, 2018). Halldorsson (2007) use transaction cost analysis (TCA)

and principal-agent theory (PAT) for answer question study they "How to structure a supply chain when it is perceived as a collaboration of institutions?". In part next will be discussed about principal-agent theory.

2.2 Principal-Agent Theory

The term principal-agent or principal agent model start appear in a number of 1970s - 1980s writings such as Williamson (1975), Mitnick (1975), Jensen & Meckling (1976), Fama (1980), Fama & Jensen (1983). Jensen & Meckling (1976) explain about definition connection agency as contract where one or more people (the principal) employ another person (the agent) to do a number of service on name those who involve delegation a number of authority taking decision to agent . If second split party in connection maximizing utility, there is trend that agent no will always Act for interest best principal. Principal could limit deviation from the importance with set appropriate incentives _ for agent and with emit cost designed monitoring _ for limit activity deviant agent. _ Connection agency arise because existence contract Among principal and agent with delegate a number of authorities taking decision to agent. In accordance with agreement the could assumed that a number of decision will give authority to agent (Jensen & Meckling, 1976).

In simple group, will have similar information, but in the more complex organization, there will be possibilities an asymmetric information between principal and agent because the agent has more complete information than principal (Schneider, 1987; Waterman & Meier, 1998). When a person delegate the rights and obligations to other people, in this condition the principal and agent problem may rise. The principal–agent literature deals with a specific social relationship, that is, delegation, in which two actors are involved in an exchange of resources. Coleman (1990) explain if One actor who wants to accomplish some goal but lacks of skills or capacities necessary to do so finds another actor with those skills or capacities and obtains the latter's services in return for remuneration of some sort. The principal is the actor who disposes of a number of resources but "not those of the appropriate kind to realize the interests. They need the agent, who accepts these appropriate resources and is willing to further the interests of the principal (Braun & Guston, 2003). In this sense, Coleman (1990) is right to speak of an "extension of self" of the principal by way of delegation. There is two kind of problem discussed in literature, the first is moral hazard and the other is adverse selection. This problems based on the new institutional economy who called it as actor opportunistic behavior, that the actor will be prioritize their self-interest rather than othe actor and try for maximizing profit and benefit for them (Braun & Guston, 2003). The principal-agent theory describes the complex relationship between principal and agent in the term of the flow of information and agent collect the relevant information from

numerous sources i.e. suppliers, customers, and stakeholders on the behalf of the principal (Kummer et al., 2020).

General Application in the field of economy is example in service health or hospital, patient is the principal, and the doctor is agent. Evans (1980) explains in Waterman & Meier (1998) with the assumption that both of them is try to maximizing their own utility rationally, patient and doctor tend to have different purposes. Patient want to be healthy but tend to pay as low as they can afford, but in the other side, Doctor will try to maximizing income and will offer more treatment. Agent maybe just have more complete information than the principal, but never share information to the principal in the purpose to reduce load of work and interests. In agency theory, principal is the party who gave command, supervise, give rating and feedback on the task to be done by the agent, then the agent is the party who receives the delegation. When the principal and agent want for to maximizing interest respectively, then there is the possibility of the agent acting not for principal goals. Principal trying for maximizing profit (risk takers), while agents as executor activity tend no like very risk adverse. the risk-sharing problem as one that arises when cooperating parties have different attitudes toward risk (Eisenhardt, 1989). To reduce conflict Therefore, the principal needs to monitor the agent's performance. Agency theory is concerned with resolving two problems that can occur in agency relationships. The first is the agency problem that arises when (a) the desires or goals of the principal and agent conflict and (b) it is difficult or expensive for the principal to verify what the agent is actually doing. (Eisenhardt, 1989) this connection is what makes the asymmetrical information arise between both. Mitnick (1975) and Shapiro (2005) argue that problem agency appear in theory agency conventional , because existence difference interest between principals and agents who lead to consequences on. Meaning is the bigger conflict principal and agent will impact on bigger agency costs for reduce this problem. This cost may influence the whole organization and principal's financial.

3. METHODS

This paper is a descriptive conceptual paper, we collect the previous literature and then developing logical and complete arguments for the association. Whetten (1989) explain that conceptual papers should be judged on the basis of seven criteria: (a) What's new? (b) So what? (c) Why so? (d) Well done? (e) Done well? (f) Why now? and (g) Who cares? Although conceptual papers need not address all of Whetten's seven questions in equal detail or resolve an existing tension in the field, it is critical to take a problem-focused approach and address the what's new question thoroughly (Gilson & Goldberg, 2015). In this paper, firstly, based on the literature review, we explain brief view blockchain technology and its relations to several topic generally and its impact to daily life and organization and with the landing page organization theory, we try to trace several theories related to blockchain application. After

we found several theories in organization related to blockchain, we address the question about principal-agent problem known as a dominant problem in organization. Section two specifically discuss about blockchain and principal-agent theory based on previous literature. Section three is explaining about the methodology, section four is further discussion about blockchain, principal-agent problem and principal-agent theory, section five is managerial implication and the last is conclusion.

4. DISCUSSION

In the previous section we argue that one of the agency problems is because of asymmetrical information and from lack of trust between principal and agent. Principal-agent relationship could define as contract between principal and agent where agent act on the name of principal because principal delegate authority to the agent. The authority usually related to decision making about the organization. Based on the ownership separation and control on activity economy between principal and agent, they may facing various problems, such as asymmetrical information, lack of trust between principal and agent, different goals to achieve, difference level of risk avoidance, uncertainty results, opportunistic behavior and bounded rationality (Bon, 2021; Halldorsson et al., 2007) .In the discussion of the paper, we try to understand the connection between principal-agency problem with blockchain implementation. Blockchain implementation is related to logistics and supply chain management (LSCM). Kummer et al (2020) explain that at least there is six articles linking blockchain in field logistics and supply chain management (LSCM) with principal-agent theory, this papers are Treiblmaier (2018), Cole et al. (2019), Chang et al. (2019), Beck, Müller-Bloch and King (2018), Murray et al. (2019), Derbali, Jamel, Mani and Al Harbi (2019. We will added three papers which have similar topic, Kaal (2020), an unpublished work master thesis of RJN Bon (2021) and Li and Fang (2022) (Table 1).

TABLE 1. PAPERS WITH BLOCKCHAIN AND PRINCIPAL-AGENT THEORY TOPIC

Authors	Year	Main discussion	Main Findings
Kummer et al (2020)			
Treiblmaier	2018	Present four grand theories widely used in SCM/ logistics research (PAT, TCA, RBV, NET) and make recommendations on how to integrate blockchain technology.	This paper presents the first step in putting together a research agenda that applies rigorous academic SCM/logistics research to the blockchain: a potentially disruptive technology with as yet unclear effects on the SCM

Authors	Year	Main discussion	Main Findings
Beck, Müller-Bloch and King	2018	Analyze how an incumbent bank deals with the radical innovation of blockchain	Blockchain requires lowering boundaries both within and across organizations. Incumbents can address blockchain technology by engaging in discovery, incubation, and acceleration, and by carefully managing the transitions between three stages.
Cole et al.	2019	An explanation and analysis of blockchain technology is provided to identify implications for the field of Operations and Supply Chain Management (OSCM)	For OSCM, a myriad of ways in which blockchain could transform practice are identified, including: enhancing product safety and security; improving quality management; reducing illegal counterfeiting; improving sustainable supply chain management; advancing inventory management and replenishment; reducing the need for intermediaries; impacting new product design and development; and, reducing the cost of supply chain transactions.
Chang et al.	2019	The purpose of this paper is to explore the applicability of blockchain technology in international trade process from a perspective of letter of credit payment	Comparative analysis and feasibility study were conducted to identify and validate the prospects, in terms of facilitating process flow and enhancing overall trade performance, of the proposed blockchain-based international trade process model
Murray et al.	2019	Explores blockchain technology's potential to alter contracting both in the market and within organizations	The growth in blockchain use cases suggests that it is increasingly important for scholars to consider how new technologies such as blockchain have the capacity to alter the way firms contract and even supplant human

Authors	Year	Main discussion	Main Findings
			agency in organizational decision-making.
Derbali, Jamel, Mani and Al Harbi	2019	Examine the importance of the blockchain on the corporate governance	Blockchain has several advantages, such as the blockchain makes possible the disintermediation and therefore the direct exchange between users without trusted intermediary, but it also has limitation which remain major obstacles to its industrialization and its generalization
Additional			
Kaal	2020	These unprecedented technological features enable corporations and other forms of business organizations to be supplemented with blockchain-based agency constructs	The technological infrastructure for DAOs enables the possibilities all member's contributions to an institution can be recorded in a fully transparent way
RJN Bon	2021	They use the lens of the principal agent theory to show that implementing blockchain technology and smart contracts in contractual agreement can alleviate problem associated with assymetrical information that arise when one party holds its information private	This thesis answers the Research Questions by showing that blockchain technology and smart contracts are a perfect fit for asymmetric information problems in the principal agent relationship.
Li & Fang	2022	A new concept, consensus perception, is proposed based on blockchain characteristics and advantages. A conceptual model is then developed based on principal-agent theory to	The results show that information security concern and openness directly and significantly influence the intention to share, and that trust has an insignificant influence

Authors	Year	Main discussion	Main Findings
		investigate how to promote information-resource sharing and whether blockchain technology positively promotes information resource sharing.	

Kaal (2019) use principal-agent theory for highlight current information in the scenario of blockchain, in order to have more transparent and accessible tall to one of the principals or agent, or both. Kaal argue that despite decades of governance experiments and extensive rule revisions, the agency problems suggest that the core underlying agency problems cannot fully be resolved within the existing theoretical and legal infrastructure. Blockchain-based technology has started to offer alternatives to the existing corporate governance solutions. Blockchain technology can facilitate the removal of agents as intermediaries in corporate governance through code, peer-to-peer connectivity, crowds, and collaboration (Kaal, 2020). Then Cole et al (2019) think that mechanism agency useful for complete or replace approach transactional and relational in blockchain scenario. Chang, Chen and Wu (2019) use agency theory for investigation on how blockchain can help increase contract efficiency and align mutual goals. Principal-agent theory used by Beck et al. (2018) to learn about governance dimension through blockchain setup, and to learn on how do incumbent organizations respond to blockchain as radical innovation also how can they build the needed competencies to rethink their current business models in the light of radical innovation. Murray et al (2021) learn about blockchain impact on agents motivation monitoring and company operations, and then discuss the lack of impact on cost excess and compensation. Derbali et al (2019) use agency theory to test opportunistic behavior and asymmetric information between agent and principal in blockchain system. Agency theory could use for investigate how parties face uncertainty and asymmetry under blockchain scenario, where we can eliminate the need of trust and blockchain technology can help for solve agency problem.

Halldorsson et al (2007) explained about the relationship between principal-agent theory (PAT) in supply chain and logistics activities in terms of new product development (NPD). The assumed behavior is that there may be differences in interests between suppliers and buyers. Usually the contract will not be made until the specifications of the product have been determined, where the contract for the manufacture of products or components of the product depends on the agreement of both parties. Any form of disagreement in contract has the potential to cause problems and conflicts between suppliers and buyers. Another example of expansion blockchain technology starting developed and utilized by industry or organization is Decentralized Autonomous Organization (DAO). DAO is organizations in the

world of assets crypto created by the world's developers. However, different with organizations that are managed by humans, all decisions in DAO are determined by computer's algorithms. That means, there is no party the have authority to control the circulation, including government and central bank. Inside the network crypto asset, whole circulation and transactions controlled by computer networks and nodes. For example in crowdfunding, there is no necessary approval form management or the board of directors, but through the open-source code (Chohan, 2017) . DAO estimated will become a blockchain based organizational model to answer specific challenge in organization which almost occurred in every industry and organization that is the principal-agent dilemma. Everytime a system is arrange with the individual or entity (agent) who owns ability to make decision or to take action on behalf individual or another people (principal), will be generate inherent risk in divergent goals, priorities, or access to information urgent from each party (Cryptopedia, 2022) . Another opinions on the Vaultoro website (2021) explain that every solution aim to resolve problem any problem exist. For DAO, that problem is dilemma principal-agent. DAO have potential to resolve or minimize the problem arise between principal-agent. General concept understands if somebody have strength for make decision on person's name or entity another. Blockchain enables better transparency and different incentive models to distribute power and consolidate it. In DAO, asymmetrical information, corruption risk, cheating behavior and opportunistic behavior can be minimized and moreover can be eliminate.

Some example DAO implementation in the real world are bitcoin, Dash, MarkerDAO and Uniswap. Although challenge in designing and implementing DAO still and have a significant progress, but DAO represents new form management and have the potential change how the world works. More organization learn to adopt the DAO platform for automation several aspects in their core business who leads to cost efficiency. Meanwhile the complexity of modern business models is increase, the interest to DAO interests need to adapt in the aim for build transparent and independent organization. For example, the manager or CEO may make decisions which are not in line with the core objectives of the company. In some cases, the agent is at liberty to carry out risky actions, knowing that any potential impact will weigh heavily on the principal stakeholder rather than on him or her in person. On the other hand, DAO overcomes dilemma principal-agent through collective or community governance of the entity. Various holder interest by volunteer join with DAO knowing that they must obey condition intelligent defined by the community. Thus, they do not need an agent, to act behalf on them (Mashell C, 2021).

DAO working with a number of stages, the first is determination smart contract agreed by all member. A Smart contract is a computer program which is located and executed on blockchain. For instance, it enables the automatic execution of changes in the status of digital assets on the blockchain to interact

with other programs in and out of the blockchain (Takagi, 2017), after smart contract set, DAO enters the stage of crowdfunding, DAO requires tokens that will used by the organization as a loan that will give to debitor and ensure right investors voice. In the case of Investment in DAO, investors have right to validate or refuse all financing projects. Every participant as stakeholder in DAO have a right to propose an idea about the future of the organization. Furthermore, participant as stakeholder will make a vote for approve or reject the proposal. After the system is executed, the DAO will operate based on the algorithm write in smart contracts. DAO's code will becomes very difficult to change after the system run including bug fixes but also hard to manipulate. Whole DAO transactions will write down in a decentralized ledger, transparent and electronics timestamped. Whole this new technology will help reduce conventional organization problem, principal-agent problem. Incentivized anonymous participants and automated smart contracts are important features to enable a DAO, Blockchain has brought a network of trust that is not dependent on human intervention (Takagi, 2017).

5. MANAGERIAL IMPLICATION

Blockchain and DAO are still in their infancy, and it is not clear yet how they will develop in the future, who will suit the technology or what risk when adopting the technology. Blockchain implementation such as bitcoin suggests the feasibility of using its underlying technology to configure economic activity as a new form of organization and to resolve conventional organization problem. Company should aware about the development of blockchain development and implementation around the world. Organization should increase their capacity and knowledge to learn about this technology, one it suitable for them, they will already have people in the company who know deeply about this new emerged blockchain technology.

6. CONCLUSION

Some people or organization assume that blockchain is a new disruptive technology, threatening the existence arrangement in the public order, but in the same time this technology considered as one of biggest innovation in the 21st century. Blockchain already affected various sectors such as finance and banking, insurance and other financial institutions, manufacturing and education. Blockchain is also the solution to one of biggest conventional organization problem, principal-agent problem, as explainer in the principal-agent theory. This reducing of organization problem lead to reducing agency cost in the in organizations that use blockchain technology bases such as Decentralized Autonomous Organization (DAO). In the DAO smart contract is set in the beginning of the process and defined as a smart contract that approved by all member. For concluding remarks, blockchain ia a distributed ledger technology,

and smart contract benefit design contract in variety connection agent. Digitization contract, compliance, audit, and document areas other could simplified or automated with blockchain technology. Decrease errors and problems principal-agent could direct to cost efficiency. This technology Solution offer disintermediation, transparency, and transactions without interference. More important, blockchain technology offers new solution for principals, agents, consumers and manufacturers in various fields.

REFERENCES

Avdzha, A. K. (2017). The Coming Age of Blockchain Technology in Corporate Governance [Tilburg University]. In Tilburg University, Master Thesis. Retrieved (Issue May). https://doi.org/10.13140/RG.2.2.22468.94083

Beck, R., Müller-Bloch, C., & King, J. L. (2018). Governance in the blockchain economy: A framework and research agenda. Journal of the Association for Information Systems, 19(10), 1020–1034. https://doi.org/10.17705/1jais.00518

BlockGeeks. (2016). What is Blockchain Technology? A Step-by-Step Guide For Beginners. https://blockgeeks.com/guides/what-is-blockchain-technology

Bon, R. (2021). Principal Agent Theory and Blockchain Technology.

Braun, D., & Guston, D. H. (2003). Principal-agent theory and research policy: An introduction. Science and Public Policy, 30(5), 302–308. https://doi.org/10.3152/147154303781780290

Chang, S. E., Chen, Y. C., & Wu, T. C. (2019). Exploring blockchain technology in international trade: Business process re-engineering for letter of credit. Industrial Management and Data Systems, 119(8), 1712–1733. https://doi.org/10.1108/IMDS-12-2018-0568

Chohan, U. W. (2017). The Decentralized Autonomous Organization and Governance Issues (Notes on the 21 St Century).

Clohessy, T., & Acton, T. (2019). Investigating the influence of organizational factors on blockchain adoption: An innovation theory perspective. Industrial Management and Data Systems, 119(7), 1457–1491. https://doi.org/10.1108/IMDS-08-2018-0365

Cole, R., Stevenson, M., & Aitken, J. (2019). Blockchain technology: Implications for operations and supply chain management. Supply Chain Manag. Int. J., 24, 469–483.

Coleman, J. S. (1990). Foundations of Social Theory. The Belknap Press of Harvard University Press.

Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). Blockchain technology: Beyond bitcoin. Applied Innovation, 2. https://doi.org/10.15358/0935-0381-2015-4-5-222

Cryptopedia. (2022). What Is a Decentralized Autonomous Organization (DAO)? Cryptopedia. https://www.gemini.com/cryptopedia/decentralized-autonomous-organization-dao#section-da-os-a-solution-to-the-principal-agent-dilemma

Derbali, A., Jamel, L., Mani, Y., & Al Harbi, R. (2019). How Will Blockchain Change Corporate

Governance? International Journal of Business and Risk Management, 2(1), 16–18. https://doi.org/10.12691/ijbrm-2-1-3

Eisenhardt, K. (1989). Agency Theory : An Assessment and Review. Academy of Management Review, 14(1), 57–74.

Fama, E. (1980). Agency problems and the theory of the firm. The Economic Nature of the Firm: A Reader, Third Edition, 88(2), 288–307. https://doi.org/10.1017/CBO9780511817410.022

Fama, E. F., & Jensen, M. C. (1983). Agency Problems and Residual Claims. Journal of Law and Economics, 26(2), 327–349. https://doi.org/10.2139/ssrn.94032

Gammelgaard, B., Welling, H. S., & Nielsen, P. B. M. (2019). Blockchain technology for supply chains. https://doi.org/10.1515/mt-1999-417-807

Gilson, L. L., & Goldberg, C. B. (2015). Editors' Comment: So, What Is a Conceptual Paper? Group and Organization Management, 40(2), 127–130. https://doi.org/10.1177/1059601115576425

Glaser, F. (2017). Pervasive decentralisation of digital infrastructures: A framework for blockchain enabled system and use case analysis. Proceedings of the Annual Hawaii International Conference on System Sciences, 2017-Janua, 1543–1552. https://doi.org/10.24251/hicss.2017.186

Halldorsson, A., Kotzab, H., Mikkola, J. H., & Skjøtt-Larsen, T. (2007). Complementary theories to supply chain management. Supply Chain Management, 12(4), 284–296. https://doi.org/10.1108/13598540710759808

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305–360. https://doi.org/10.2139/ssrn.94043

Kaal, W. (2019). Blockchain Solutions for Agency Problems in Corporate Governance. The CLS Blue Sky Blog. https://clsbluesky.law.columbia.edu/2019/05/23/blockchain-solutions-for-agency-problems-in-corporate-governance/

Kaal, W. (2020). Decentralized corporate governance via blockchain technology. Annals of Corporate Governance Published, 5(2), 101–147. https://doi.org/10.1561/109.00000025

Kar, A. K., & Navin, L. (2021). Diffusion of blockchain in insurance industry: An analysis through the review of academic and trade literature. Telematics and Informatics, 58(May 2020), 101532. https://doi.org/10.1016/j.tele.2020.101532

Kummer, S., Herold, D. M., Dobrovnik, M., Mikl, J., & Schäfer, N. (2020). A systematic review of blockchain literature in logistics and supply chain management: Identifying research questions and future directions. Future Internet, 12(3). https://doi.org/10.3390/fi12030060

Laroiya, C., Saxena, D., & Komalavalli, C. (2020). Applications of Blockchain Technology. In Handbook of Research on Blockchain Technology (pp. 213–243). INC. https://doi.org/10.1016/b978-0-12-819816-2.00009-5

Li, G., & Fang, C. C. (2022). Exploring factors that influence information resources sharing

intention via the perspective of consensus perception of blockchain. Information Technology and Management, 23(1), 23–38. https://doi.org/10.1007/s10799-021-00338-4

Lorne, F. T., Daram, S., Frantz, R., Kumar, N., Mohammed, A., & Muley, A. (2018). Blockchain Economics and Marketing. Journal of Computer and Communications, 06(12), 107–117. https://doi.org/10.4236/jcc.2018.612011

Markets & Markets. (2016). Blockchain Market with COVID-19 Impact Analysis, by Component (Platforms and Services), Provider (Application, Middleware, and Infrastructure), Type (Private, Public, and Hybrid), Organization Size, Application Area, and Region - Global Forecast to 2026. https://www.marketsandmarkets.com/Market-Reports/blockchain-technology-market-90100890.html

Mashell C. (2021). DAOs: Why the world can no longer do without them? Gate.Io. https://www.gate.io/blog_detail/382/daos-why-the-world-can-no-longer-do-without-them

Mitnick, B. M. (1975). The Theory of Agency. Public Choice, 24(1), 27–42. https://doi.org/10.1111/j.1541-1338.1982.tb00448.x

Murray, A., Kuban, S., Josefy, M., & Anderson, J. (2021). Contracting in the smart era: The implications of blockchain and decentralized autonomous organizations for contracting and corporate governance. Academy of Management Perspectives, 35(4), 622–641. https://doi.org/10.5465/amp.2018.0066

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Decentralized Business Review, 15(4), 580–596. https://doi.org/10.1108/TG-06-2020-0114

Raharjo, B. (2010). UANG MASA DEPAN (M. C. Wibowo (ed.)). Yayasan Prima Agus Teknik.

Savelyev, A. (2017). Contract law 2.0: 'Smart' contracts as the beginning of the end of classic contract law. Information and Communications Technology Law, 26(2), 116–134. https://doi.org/10.1080/13600834.2017.1301036

Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. Journal of Purchasing and Supply Management, 25(4), 100552. https://doi.org/10.1016/j.pursup.2019.100552

Schneider, D. (1987). Agency Costs and Transaction Costs: Flops in the Principal-Agent-Theory of Financial Markets. Agency Theory, Information, and Incentives, 481–494. https://doi.org/10.1007/978-3-642-75060-1_25

Shapiro, S. P. (2005). Agency theory. Annual Review of Sociology, 31, 263–284. https://doi.org/10.1146/annurev.soc.31.041304.122159

Takagi, S. (2017). Organizational Impact of Blockchain through Decentralized Autonomous Organizations. International Journal of Economic Policy Studies, 12(1), 22–41. https://doi.org/10.1007/bf03405767

Treiblmaier, H. (2018). The impact of the blockchain on the supply chain: a theory-based research framework and a call for action. Supply Chain Management, 23(6), 545–559. https://doi.org/10.1108/SCM-01-2018-0029

Vaultoro. (2021). What Is A Decentralized Autonomous Organization (DAO) And Why Does It

Matter? Vaultoro. https://vaultoro.com/what-is-a-decentralized-autonomous-organization-dao-and-why-does-it-matter/#h-exploring-the-principal-agent-problem

Waterman, R. W., & Meier, K. J. (1998). Principal-agent models: An expansion? Journal of Public Administration Research and Theory, 8(2), 173–202. https://doi.org/10.1093/oxfordjournals.jpart.a024377

Whetten, D. A. (1989). What constitutes a theoretical contributions. 14(4), 490–495.

Wizner, B. (2018). Edward Snowden Explains Blockchain to His Lawyer — and the Rest of Us. ACLU Blog. https://www.aclu.org/blog/privacy-technology/internet-privacy/edward-snowden-explains-blockchain-his-lawyer-and-rest-us

Zheng, Z., Xie, S., Dai, H. N., & Chen, X. (2018). Blockchain challenges and opportunities: a survey. International Journal of Web and Grid Services, 14(4), 352. https://doi.org/10.1504/ijwgs.2018.10016848