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Unlocking the Business Model Innovation Potential on a Public Blockchain Ecosystem: A Critical Realism Approach

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ABSTRACT

This study aims to explain the phenomenon of blockchain technology in business model innovation in the public ecosystem since it offers huge potential benefits for business activities to overcome existing problems, such as data ownership, security, and accessibility. This study uses the realism perspective for understanding the phenomenon. The multiple-case study strategy presents five blockchain experts who use the value system framework to find potential for public blockchain applications. The study finds that in the public blockchain ecosystem: (i) value capture is oriented to enlarge new potential income; (ii) value creation is carried out through partnerships with other entities; (iii) value delivery is delivered through decentralized application and smart contracts; and (iv) value propositions help to solve public problems. From the findings, this study proposes three types of added value. First, low value-added, i.e., blockchain exchange data/information exchange and security; second, medium value-added, wherein technology initiates collaboration performance among entities in the public ecosystem; and finally, high value-added, i.e., a blockchain encourages new market innovation. This study focuses on the literature on blockchain and business models as well as potential future research.

KEYWORDS

Blockchain technology
Business model innovation
Public ecosystem
Value-added

INTRODUCTION

Blockchain technology is a technological innovation that carries a decentralized paradigm through a chain mechanism connecting data/information blocks. The data/information utilizes asymmetric encryption to perform transaction security and is immutable (Rahmadika and Rhee, 2018). The technology was initially applied to the financial sector in cryptocurrency, e.g., Bitcoin (Nakamoto, 2008). The emergence of Bitcoin has shaken the global financial sector, as it allows digital transactions without using third parties, i.e., transactions can be carried out directly (peer-to-peer) and eliminate the intermediation process. The role of blockchain technology is proliferating because it can solve business problems that require trust in collaboration, defined as "digital trust."

The value of digital trust in technology is due to the system adopting the concept of witnesses and verifiers (Shin, 2019). This system is implemented with a decentralized protocol that involves

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other nodes in its implementation-registered members. The more nodes, the safer the data/information exchange. Interaction between nodes is a key to implementing a decentralized protocol. Supervision protocols are implemented through distributed data equally to all nodes in a specific ecosystem (Kshetri, 2017). They gain equal access to data/information as the basis for the technology's digital trust value, which enables a reduction of disputes in business collaboration. Without the presence of other nodes, the system cannot operate effectively.

The development of blockchain technology follows organizations' need to perform business activities. Although initially it was only implemented in a particular area, i.e., the financial sector, the system can be used in other sectors involving data/information synchronization (Casino et al., 2019). The technology develops integration between parties with different interests to achieve common goals. The presence of such technology has the potential to create data/information integration between entities or units. Tönnissen et al. (2020) elaborate on the privilege of blockchain technology – not just in the sophistication of the system but rather in a decentralized protocol that enables integrating interests through a collaboration platform.

Blockchain platform applications can reduce the difficulty for a community in obtaining data/information across sectors. For instance, blockchain technology is essential and unlocks the health sector's potential (Mettler, 2016; Roehrs et al., 2019). Through this technology, fundamental problems in this sector can be resolved, such as helping monitor the circulation of drugs and food, providing accurate data/information of individual patients, and increasing public access. For public service, this technology gives transparency in providing data/information on asset ownership, which is a real problem faced by each country (Poszler et al., 2018; Hughes et al., 2019). Chen (2018) suggests that the blockchain platform encourages equality of innovation and entrepreneurship through two benefits: (i) provide funding alternatives for entrepreneurs (Chen and Bellavitis, 2020) and (ii) provide an innovation platform through decentralized applications. However, previous studies have not provided strong evidence explaining how the relationship between blockchain technology and business model innovation helps solve public problems, such as data ownership, security, and lack of accessibility. Thus, the research question can be formulated as, "How does the public blockchain ecosystem initiate a business model innovation?"

This study aims to fulfill the research gaps in the value system framework by explaining that blockchain technology and business model innovation coexist to solve public problems. This study uses the critical realism paradigm to explain the phenomenon, especially in the public blockchain ecosystem, which is considered to have great potential in providing economic and social benefits for the community. This research's main contribution is to explain how the phenomenon of blockchain technology coexists with innovation in business models. This study was conducted in Indonesia because technology like the blockchain is needed to mitigate public problems, e.g., asymmetric information and moral hazards.

The structure of this manuscript consists of: (i) introduction, which illustrates the background of the study, review of the literature, and the research framework; (ii) research methods, description of research design; (iii) results and discussion, explanation of findings and propositions; and (iv) study conclusions and further research recommendations.

LITERATURE REVIEW

Business Model Innovation

The discussion of business model innovation is derived from a business model, i.e., a business activity used to generate profits and an organization's need to find out its system in detail (Afuah, 2003).

Zott and Amit (2010) define a business model as an interconnected organizational element that explains how a system operates. It contains important pillars: (i) content being activated; (ii) key actors; and (iii) governance to realize the content. Teece (2010) reveals that the essence of a business model is to provide products or services based on consumer behavior to make a profit: "A business model articulates the logic, data, other evidence that supports a value proposition for the customer, and a viable structure of revenues and costs for the enterprise delivering that value." Because it is based on consumer behavior, this business model can shape a responding environmental dynamic.

The essence of business model innovation changes an existing business model into a new business model. Demil and Lecocq (2010) define business model innovation as a search process for interactions between elements in the model. Simply put, organizations adapt and learn to respond to environmental changes. Johnson, Christensen, and Kagermann (2008) popularize the elements of business model innovation and serve as a reference in concept development. The first element is customer value proposition (CVP), which encompasses the customer segment and its problem (value offer). The second is the infrastructure, which explains how organizations create and deliver value offers. The link between resources and organizational activities is the key to implementing value creation. Finally, economic logic is an instrument that justifies business model feasibility. They are combined into a system that interacts and influences others.

Blockchain and Business Model Innovation

Blockchain technology transforms into a collaboration platform that allows an organization to interact with other organizations. Through this interaction, the exchange of data/information can be implemented fairly. Decentralization becomes a blockchain technology protocol to validate the process of exchanging data/information. Transactions can only occur when other members process the transaction and approve it (Oh and Shong, 2017). In addition to providing the value that organizations need, blockchain technology can also change the way organizations do business. The advantages of technology enable an organization to initiate business model innovations.

Business model innovation is an organization's effort to change its business model as a response to dynamic change. This innovation vehicle is considered more effective and efficient compared to other types of innovation. This innovation has two main approaches: (i) trying to match customer needs and organizational limitations; (ii) using the concept of collaboration to reduce organizational constraints. Business model innovation is a search process and allows change to occur through interactions between the core components in the model (Demil and Lecocq, 2010). Another definition states that changing business models is a process of learning and experiencing previous business models to predict the next business model (Teece, 2010). Chesbrough (2010) defines business model innovation as a search that focuses on novelty in response to changes in the business environment. The presence of technology can help organizations make changes to business models.

The effect of blockchain technology on business model innovation is an attraction for academic researchers. This argument is in line with developing the concept of a business model that is expanding rapidly as internet technology evolves. Thus, the link between blockchain technology and changes in business models is relevant. Nowiński and Kozma (2017) and Morkunas et al. (2019) reveal the influence of blockchain technology on business model innovation through visualization of two different frameworks, i.e., business model canvas and integrated business model. Chen (2018) and Chen and Bellavitis (2020) find a strong relationship between blockchain technology and the potential for economic equality. Friedlmaier et al. (2017) explore the possibility of technology disrupting business through its ability in various sectors.

This study used a value system framework in business model innovation to understand the phenomenon of blockchain technology. A values system is a concept for understanding business model innovation through a framework of intervalue relationships (Bocken et al., 2015). Value systems consist of value capture, value creation, value delivery, and value propositions that are interactive and nonlinear. The elements consist of activities that interact with and influence each other in a business model design (Zott and Amit, 2010).

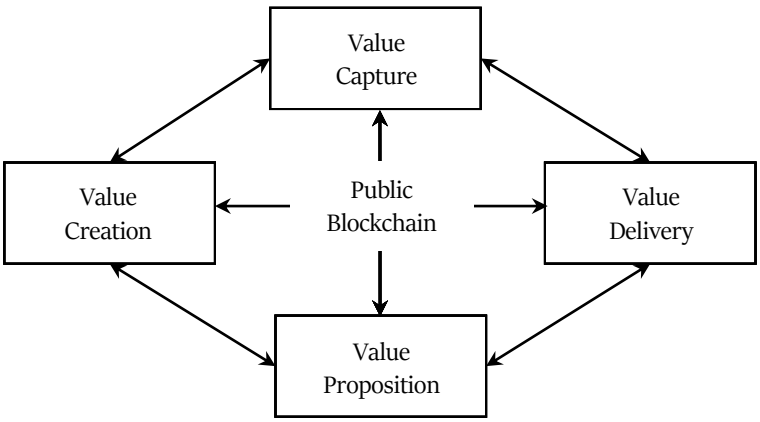

Figure 1. Research framework

Value capture is an indicator of a formulation of measurement tools for economic feasibility. The economic formulation is the closest parameter to explain a business potential (Baden-Fuller and Haefliger, 2013). In a further step, Demil and Lecocq (2010) emphasize that realizing business potential needs to be clarified. How to realize it is a question that must be answered in the dimension of value creation. A value proposition is a value inherent in the implications of value capture and value creation (Boons and Lüdeke-Freund, 2013). Without value, customers find it challenging to understand the products or services that an organization offers. Thus, an organization needs to understand the delivery of value to its customers. Without value delivery, business creations and values are impossible to realize. Communication and customer relations need to be understood so that value delivery is effective (Schaltegger et al., 2012). A value proposition is an essential element in formulating a value system. From this explanation, it can be concluded that the value system is a framework that can help business model innovation.

RESEARCH METHOD

This research used a critical realism paradigm to explain how blockchain technology and business model innovation coexist. The paradigm of critical realism exists to fill the void of two extreme paradigms, i.e., positivism and interpretative (idealism). Bashkar (2008) identifies that truth, according to critical realism, is layered and stratified. Realism views truth not only from the perspective of experience but also from events and mechanisms. This paradigm seeks to separate knowledge from reality to find the true truth. Therefore, the critical paradigm is the most suitable research approach in explaining social phenomena. The relevant implication of this paradigm performs abductive reasoning as a research method, and it works iteratively among knowledge and reality (Spens and Kovács, 2006). Furthermore, the case study is the most appropriate strategy to explain the phenomenon. The critical realism landscape is presented in Table 1, as adopted from Saunders, Lewis, and Thornhill (2019).

The case-study work hooks knowledge and reality iteratively (Yin, 2014). This research used a multiple-case study in order to (i) predict the same results; (ii) predict different outcomes. Thus, to apply the multiple-case study, this research used several informants who have expertise in blockchain technology and its application in the public ecosystem to generalize the findings (Eisenhardt, 1989). The process in this study began with case selection and protocol design, as presented in Figure 2. Subsequently, the data collection was carried out on selected informants. The analysis results of each case served as a basis for comparison among cases to perform heterogeneity and homogeneity (data triangulation).

Table 1. Critical realism philosophy

Ontology	Stratified/layered (the empirical, the actual, and the real); external, independent intransient; objective structures; causal mechanisms.
Epistemology	Epistemological relativism; knowledge historically situated and transient; facts as social constructions; a historical causal explanation as a contribution.
Axiology	Value-laden research; the researcher acknowledges bias by world views, cultural experience, and upbringing; the researcher tries to minimize bias and errors; the researcher is as objective as possible.
Typical methods	Abductive reasoning; in-depth historically situated analysis of pre-existing structures and emerging agency; a range of methods and data types to fit the subject matter.

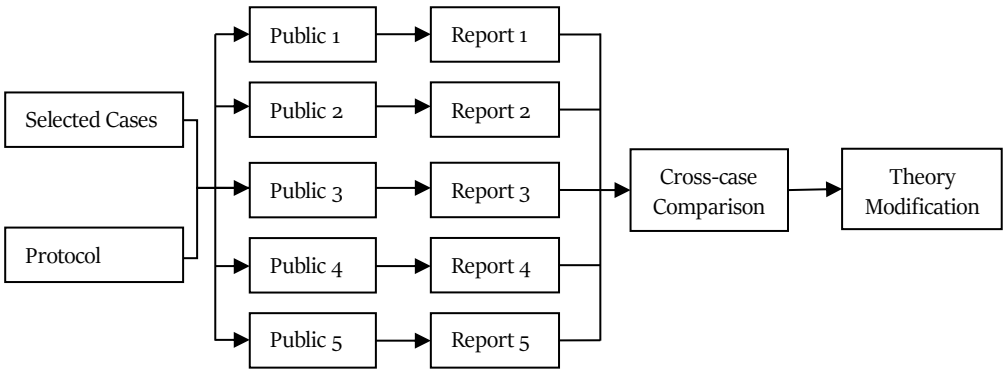

Figure 2. Research process

The synthesis process, based on a multiple-case study, started with preliminary research of the public blockchain phenomenon. At the same time, an understanding of the topic was obtained from a literature review. This study used five different cases to modify the theory through cross-case conclusions. However, each case needed to be analyzed first with the results of independent and separate analysis. After that, the new cross-case synthesis process was carried out. This study conducted an analysis based on similarities or differences between cases. Hereafter, a research proposition was proposed.

This study's informants consisted of five different cases but shared the same context, i.e., the public blockchain (Table 2). The key informants were selected from Indonesian Blockchain association (ABI). Apart from being a professional as a blockchain developer or user, the individual is also a member of the association. This study provided a preliminary questionnaire to justify the research instrument. To obtain credible data/information, this study used several parameters to determine the informant's eligibility: (i) experience of working in public blockchains; (ii)

communication skills; (iii) availability of minimum one-hour interview time; and (iv) willingness to contribute to this study.

Table 2. Interviewees' profiles (pseudonym)

Interviewees	Position	Organization	Duration
Mahmud	Chairman	Public 1	1:15
Jessica	Cofounder	Public 2	1:11
Jean	System Specialist	Public 3	1:36
Gustavo	General Manager	Public 4	1:14
Rain	Director	Public 5	1:27

Eisenhardt (1989) followed the grounded theory (Glaser and Strauss, 1967) research process to perform a robust qualitative case study. The process is defined to be more systematic in analyzing qualitative information. This analysis process is known as the coding process, which sequentially consists of open coding, axial coding, and selective coding. Open coding is a process of conceptualizing data/information from informants directly. Axial coding is a process of categorizing concepts obtained from the previous cycle. Selective coding is the process of summarizing the categorization that results from axial coding. All three are iterative and nonlinear, as illustrated in Figure 3.

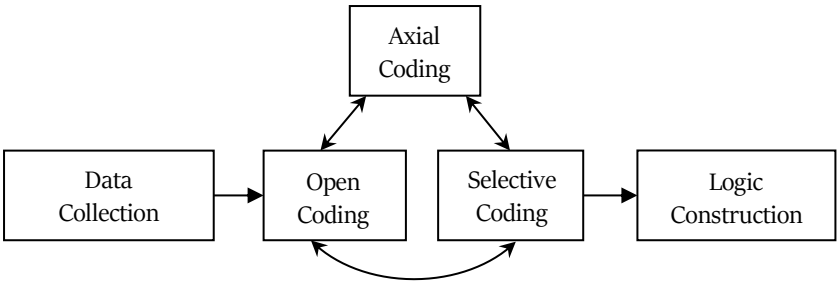

Figure 3. Case-study-based qualitative coding process

The qualitative approach of this study was carried out using semi-structured interviews, which aims to obtain more in-depth data/information to understand a phenomenon by prioritizing informants' convenience (Adams, 2015). This study used a determination protocol as a reference for interviews, thus improving the validity and reliability of data/information obtained from informants.

RESULTS

The research analysis used a coding process based on data/information obtained during in-depth interviews. This process took place iteratively among open coding, axial coding, and selective coding.

Open Coding

The open coding process uses a reference value system framework, which consists of value capture, value creation, value delivery, and value proposition. Open coding is obtained through line-by-line analysis.

Value Capture. A public blockchain opens opportunities through new economic creations, as illustrated in Table 2. The new economy can create new revenue and fixed income. New revenues

are an implication of the creation of new business activities. Blockchain technology allows the creation of new businesses through working principles, which can integrate data/information that is not yet connected. These business creations generate new types of income. For example, blockchain technology can integrate academic data/information. This integration can occur peer-to-peer between providers of workers or universities and the world of work. This case can be used as a new income source for a university to provide accurate and safe data/information services.

> "Conceptually, platforms in the public blockchain ecosystem serve to secure data, but the business benefits can roll like a snowball. Public data can be used as a new business initiative because the data is valid, created by a trusted source, and maintained because of many nodes used to verify every transaction." – Gustavo, Public 4

Another economic opportunity that arises as an effect of the public blockchain ecosystem is investments. Blockchain technology is a collaboration platform that can bridge investment. Through this collaboration, business opportunities can be increased. The investment results can be used as recurring income for investors. In the property sector, blockchain technology allows new schemes for investing. Previously, property ownership was only able to be accessed by several parties who had sufficient funding. With blockchain technology, investment in the property sector can be distributed. Thus, everyone has an equal opportunity to obtain economic benefits.

Value Creation. Blockchain technology with decentralized protocols allows each member to have equal access to data/information (Table 3). The protocol is formed so that no party controls the system, as in a centralized system. Other members have equal rights and obligations. Each member has the right to access data/information and protect the data/information transaction. To maintain this sense, a blockchain platform must have similar interests. Through this mechanism, equality can be maintained because of the check-and-balance process between registered members.

Table 3. Open coding of value capture

Dimension	Open coding	Rationale
Value Capture	New revenue	Opportunities from new markets or new businesses creation
	Recurring income	Sustainable returns from investment activities that are formed as dividends or any other forms

Value creation in the public ecosystem can also be performed through peer-to-peer relationships. This mechanism is the implication of the decentralized protocol blockchain technology. The relationship can occur only when data/information is scattered throughout all nodes. The distribution of data requires each node to interact to maintain data/information transactions. The involvement of ecosystem members is crucial for maintaining the continuity of data/information exchanges. Each contacting node interacts and acts as a witness and verifier. More nodes involved in this system will help the process of data/information transactions.

> "... decentralized systems such as public blockchain can solve inequality problems in society. While using other systems, individuals with limited capital cannot access the opportunity. The presence of blockchain improves these circumstances." – Rain, Public 5

Value Delivery. The implementation of blockchain technology in the ecosystem uses code or programming language embedded in the technology, as shown in Table 5. The embedded code has clear procedures and serves as a legal basis for all activities. In other words, the code is the law of implementing this system. The code uses a programming algorithm so that it runs systematically.

The code or programming language minimizes errors. The developed system needs to be agreed upon between nodes who are members of the ecosystem. Because it facilitates public needs, the protocol used generally follows the rules of public goods. For example, investment schemes developed on the platform use investment procedures in general – from total ownership to investment sharing. The use of code or programming languages makes the blockchain a suitable platform for applying general business activity without the need for a mediator.

Table 4. Open coding of value creation

Dimension	Open coding	Rationale
Value Creation	Equality	All nodes have an equal position to access data and information
	Interest similarity	The similarity of needs to access data and information
	Peer-to-peer network	Form the relationship between nodes as a model of a decentralized system
	Social inclusivity	The community involves supporting the oversight function and transaction verifier.

"It must be understood that the strength of smart contracts is a part of the blockchain. The smart contract basic concept is the law that is inherent to the code. Thus, the code is the rule. Most smart contract systems are implemented in the public domain, and the process is transposed..." – Gustavo, Public 4

Table 5. Open coding of value delivery

Dimension	Open coding	Rationale
Value Delivery	Legal procedure	Law inherent in the platform
	Algorithm-based	A systematic procedure used to support the blockchain system
	Two-way communication	Receive and respond to activities as a consequence of supporting the decentralized system. This mechanism forces the node to monitor data and information at the same time.
	Disintermediation	Relationships receive and respond to data. This mechanism forces the node to monitor and verify transactions simultaneously.

The use of blockchain technology requires interaction between members or nodes registered in the ecosystem. Communication between members is a mechanism that is carried by this technology to support the decentralized protocol. Member should be active and responsive in exchanging data/information on the blockchain platform, which requires a strong response from other members when making transactions. Because of their consensus, data/information exchange can only occur when other members verify and acknowledge the transaction. Decentralized protocol implies that disintermediation can be achieved.

"...the centralized system is held by a single party. Then, it is possible to control the system. In a centralized system, we are forced to trust the third party, which is difficult to do. Most cases encountered often are those in which the organization with considerable financial power or position is the actual owner of the system." – Jean, Public 3

Value Proposition. The implementation of blockchain technology performs value-to-business collaboration (Table 6). The first is a decentralized authorization. Every member of an ecosystem has an equal position through a consensus scheme. Consensus can only work when other members respond to the data/information exchange process. The process of exchanging data/information on

the blockchain platform requires verification from another party. Other members have full rights to verify based on data/information available on the distributed data.

Second, decentralized protocols require that data/information be distributed evenly to all members of the ecosystem. This form of supervision is carried out by every member registered in an ecosystem. Such supervision can occur because each member has equal access to data/information. Through this interaction, the exchange of data/information becomes safer.

> "The database in the blockchain platform is distributed into all registered nodes. The implication is that authority is distributed to them also." – Rain, Public 5

The third is traceability. The fundamental concept of a blockchain system is sequentially sequenced data/information. Transactions can only occur if the previous transaction is secured using specific codes. In other words, the process of making data/information cannot be formed without prior data/information. The working mechanism of this technology makes data/information indestructible or lasting.

In some cases, traceability of data/information becomes the essential value of a business. A supply chain that involves many parties requires a system that can accommodate the traceability of data/information through an integrated approach. With this traceability, the product becomes more valuable and reduces disputes between members in a single supply chain.

> "Traceability is a unique value provided by the blockchain platform. This platform records all events or transactions made sequentially. This uniqueness makes the transaction traceability more efficient by using blockchain." – Mahmud, Public 1

The fourth is encrypted data/information. A viable system must accommodate the fundamental needs of data/information exchange, namely, data security. Understanding data/information security is a condition that assures that data/information cannot be misused. Data/information can only be obtained and executed through correct procedures. In decentralized systems such as a blockchain, data/information security is a top priority. The system allows other members in an ecosystem to monitor data/information transactions through equal access to that data/information. Blockchain technology uses a layered, random, and distributed data-encryption mechanism.

> "The basis of blockchain performance is transaction records. If there is a transaction recorded, that is called the first stage of encryption. It is then secured again using software and ends up with accounting encryption..." – Jean, Public 3

Table 6. Open coding of value proposition

Dimension	Open coding	Rationale
Value Proposition	Decentralize authorization	The system offers authority to each node to perform the transaction using a consensus scheme.
	Distributed data	Data are distributed among the nodes involved in the platform ecosystem.
	Traceability	Blockchain uses a chain system to perform subsequent blocks. Transactions on each block are guaranteed by a unique seal on the previous block.
	Encrypted data	Data in each block are secured by rewriting the data and by software before being distributed.

Coding Process

The open coding process produces several concepts that explain the value system. Open coding in value capture produces two new revenue concepts and in-house recurring. In value creation, open coding produces four concepts: equality, interest similarity, peer-to-peer networks, and social inclusivity. Legal procedure, algorithm-based, two-way communication, and disintermediation are concepts that have dimensions of value delivery. The concepts of decentralized authorization, distributed data, traceability, and encrypted data explain how the values are highlighted in the public blockchain ecosystem on the value proposition dimension. A detailed explanation of the value coding process is presented in Table 7.

Table 7. Conceptual coding process of value system

Dimension	Selective coding	Axial coding	Open coding
Value capture	Revenue orientation	Economic viability	New revenue
			Recurring income
Value creation	Public partnership	Community	Equality
			Interest similarity
		Public platform	Peer-to-peer network
			Social inclusivity
Value delivery	Smart contract	Automation	Legal procedure
			Algorithm-based
		Peer-to-peer transaction	Two-way communication
			Disintermediation
Value proposition	Market-based value	Accessibility	Decentralized authorization
			Distributed data
		Immutable	Traceability
			Encrypted data

The coding process in value capture produces economic viability at the axial coding stage. The concepts of new revenue and recurring income in open coding are oriented to new businesses' feasibility through new financial creations. New revenue is a manifestation of creating a new business or business development that the blockchain platform might facilitate. The argument is that the platform can unlock the potential for business creations that were previously challenged to realize. These new business opportunities at the same time open opportunities for investors to participate in developing a business. Economically, investment could perform a share of revenue or fixed income. Therefore, in the public ecosystem, value capture is oriented toward income orientation.

The coding synthesis in the creative dimension results in a selective coding public partnership. Engagement between elements through partnerships is a way to optimize business model innovation opportunities. Public partnership results from the synthesis of the concept of community and public platform. Equality is a fundamental principle that forms the foundation of the community. The next concept, i.e., public platform, is a synthesis of peer-to-peer networks and social inclusivity. Through public platforms, business model innovations in the public ecosystem can be realized. The realization of public ecosystem innovation requires interaction between elements in the public sector.

The smart contract, as an agreement among members which operates automatically, is a mode to distribute values in the public ecosystem. Automation of this agreement can occur because it becomes legal through an algorithm attached to the platform. Because it is coded or algorithmic, the

system runs according to the agreed-upon code. It implies that transaction errors can be avoided. Smart contracts can be realized due to peer-to-peer transactions. The peer-to-peer transaction is a synthesis of the concept of two-way communication and disintermediation, which is the result of line-by-line analysis on the value delivery dimension.

The selective coding stage in the value proposition dimension obtains market-based value as a concept representing the public blockchain ecosystem. The idea occurs from the open coding process that results in decentralized authorization, distributed data, traceability, and encrypted data/information. Then, decentralized authorization and distributed data produce the concept of accessibility in the axial coding process. One of the public blockchain ecosystem's objectives, among others, is to provide community access to data/information. Simultaneously, the concept of traceability and encrypted data initiates the idea of immutability in the axial coding process. A blockchain mechanism that works like a chain allows data/information to be stored and remain immutable.

DISCUSSION

The role of blockchain technology in business model innovation encourages the resolution of public problems, such as data ownership, security, and accessibility. Furthermore, the public blockchain platform can initiate new opportunities (Chalmers et al., 2019; Chen and Bellavitis, 2020). A public blockchain can change how business is performed, which was previously difficult to realize using conventional platforms. Through this platform, everyone has equal access to business activities. The concept of a sharing economy can be optimized by using a public blockchain platform. Sharing the economy that developed in Indonesia remains inefficient because the country still uses a centralized system. The system even allows additional costs. With the blockchain platform, the economy can be redistributed more efficiently.

The effort to realize blockchain technology requires a public partnership. This approach connects stakeholders in a public platform to unlock innovation potentials. Through collaboration mechanisms, blind spots can be reduced which will stimulate the creation of new opportunities (Fisch, 2019; Martino and Bellavitis, 2019). Collaboration in value creation also acts as a function of data/information control in a decentralized system. The involvement of many parties in this ecosystem makes data/transactions more secure. Digital trust can also be realized.

Digital trust is also realized through the implementation of smart contracts, which are the basis of interaction between members in the public blockchain ecosystem. Smart contracts facilitate interaction between code-based nodes or programming languages (Smentyna et al., 2019). Through a codebase, data/information transactions become safer and more efficient. Transactions can run automatically. Smart contracts make transactions safer because: (i) the code is an essential legal procedure at the time of the transaction; (ii) the code or algorithm can reduce transaction errors. Smart contracts also make transactions more efficient because: (i) transactions are automated, so they do not require supervision using humans; (ii) blockchain technology accommodates massive numbers of members in the ecosystem.

Proposed Preposition

The case study emphasizes the relationship between real-life observation and theoretical framework in an iterative process, as suggested by Eisenhardt (1989). The search for cross-case patterns drives the determination of the proposed proposition. In the case study, the search for similarities and

differences is a way to develop theories. Usually, each case can explain the relationship between constructs. Then, this logic is replicated in other cases as well as testing the research validity (Yin, 2014). To justify the logic among cases, this study unfolds the literature before it proposes as a proposition, as presented in Figure 4, modified from Spens and Kovács (2006).

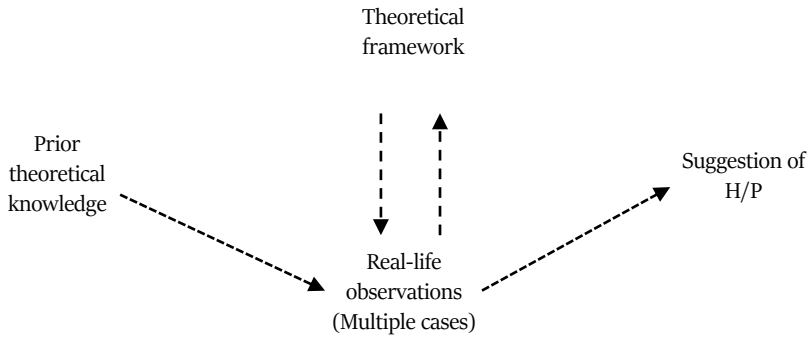

Figure 4. Preposition development process

The public blockchain ecosystem opens potential business value. This study proposes three potentials that the public blockchain ecosystem can provide (Figure 4). First, the public blockchain ecosystem can facilitate the exchange of public data/information. Some public sectors need a system that provides equal access to the community. In the sphere of health, health data/information is essential for the community. Through blockchain technology, the potential for health problems such as drug and food distribution can be tracked (Mettler, 2016; Roehrs et al., 2019). Also, public health data/information can be stored safely and accessed when the community needs it (Casino et al., 2019). Further, academically, the use of a blockchain can help secure individual data/information. Likewise, with other public sectors. Based on these senses, the proposition enables formulation as follows:

Proposition 1: Public blockchain adoption facilitates data/information transactions and security.

Blockchain platforms that adopt a decentralized protocol offer opportunities for collaboration. The most basic collaboration is in the use of the platform. Through this collaboration, the exchange of data/information becomes more secure and affordable. In its application in the health sector, for example, collaboration can occur in improving public service facilities (Poszler et al., 2018; Hughes et al., 2019). Health institutions can use the platform to access data/information and use it as a community health inspection service. On the other hand, the community has data/information users and verifiers. Thus, the proposition of research can be formulated.

Proposition 2: Public blockchain adoption serves as a collaboration platform to integrate data/information among entities.

The utilization of a blockchain platform can unlock new economic potentials, i.e., economic democratization. The technology allows equal access for its members through decentralized protocols. This platform can become the initiator of a new form of business that can create unique economic benefits through this protocol. The blockchain can also be used as an equitable investment platform (Chen, 2018; Chen and Bellavitis, 2020). Through this access, all communities have the opportunity to be exposed to investment instruments. Through ICO, everyone has the same right to invest. ICO is alternative funding for new businesses to obtain capital. Businesses can also use this

funding alternative to develop or create new businesses while investors receive a recurring income of profit-sharing or dividends from the business. The argument that formulates the proposition is:

Proposition 3: Public blockchain adoption potentially initiates a new venture creation.

The public blockchain platform can initiate various potential added values (Figure 5). Fundamentally, the blockchain platform is a secure data/information transaction provider system. Then, with the public blockchain added value as a collaboration platform, each member has a complementary relationship through a decentralized protocol role and moves both ways, as the transaction agent and supervisor. Blockchain technology initiates new business opportunities through public fundraising. This platform intervention facilitates meetings between investors and businesspeople who need funds to create new business through smart contracts, through which businesspeople can obtain alternative funding via investment in the form of crowdfunding.

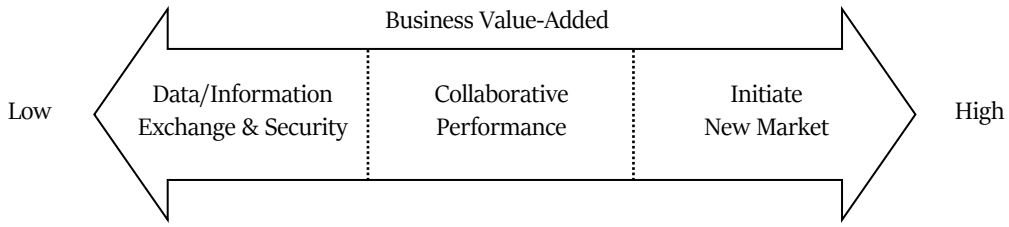

Figure 5. Business value added of public blockchain ecosystem

CONCLUSION

This study aims to understand how blockchain technology and business model innovations in public ecosystems are used. It discovers the potential for innovation in business models through a value system via inductive coding. The study findings include: (i) value capture is in the revenue orientation ecosystem; (ii) value creation is implemented through a public partnership, collaborating with other members to optimize business opportunities; (iii) a value-deliver platform block is organized through smart contracts that run automatically; and (iv) value propositions in this ecosystem are market-oriented.

The research findings initiate several propositions that explain the benefits of the blockchain platform in the public ecosystem. The public blockchain ecosystem platform can create added value from low value-added to high value-added. A low value-added public ecosystem provides secure data/information exchange through a decentralized protocol. Second, the moderate value-added public ecosystem is a collaborative platform that enables collaboration between members for similar purposes. The third is a platform for creating new economics through raising data in the form of crowdfunding. New business initiatives have the potential to create new revenues for entrepreneurs and as an equal instrument to perform investment returns for investors. Through crowdfunding mechanisms, business actors can obtain alternative funds that are difficult to realize with conventional funding mechanisms.

MANAGERIAL IMPLICATION

This study serves as a reference for the public blockchain in business model innovation. Blockchain defines a wide range of preference benefits in the public ecosystem, which offers more advantages than other ecosystems. Inclusive engagement is the primary key of this system. The decision-making or data/information exchange verification employs a consensus scheme. The decision is only possible if the entire ecosystem approves the particular transaction. This ecosystem guarantees data/information security since the data/information is stored and distributed across decentralized servers. When a problem occurs on a server-technical problem or cyberattack, other servers can secure the system performance. The application of this ecosystem can be performed to guarantee intellectual property, land ownership, and digital identity. However, this ecosystem has the potential for 51% attack.

The public blockchain encourages inclusive collaboration to increase the value of a particular system. Traceability is a value that is possible in this ecosystem. Blockchain contributes significantly to serving symmetrical information in a specific system through inclusive surveillance. This value can be applied to the health sector that is likely exposed to manipulated risk. In this sector, blockchain entangles society collaboration to ensure traceability of drug counterfeiting. This technology can also be applied to a commodity supply chain that requires detailed information in the sequence activity. A certified commodity, such as coffee and palm oil, requires a system to guarantee data/information integrity to perform its symmetry.

Technological adoption such as blockchain performs as an enabler for creating new market potentials. To explain this value, crowdfunding probably is the most appropriate example of this ecosystem. Blockchain's system can guarantee the crowdfunding transaction through a more inclusive involvement. The system complexity can be accommodated by smart contract as an instrument to perform "digital trust" among the entities. This configuration serves the financial access to the specific segments that were previously difficult to reach. Blockchain encourages simultaneous benefit, spans the broader market, and provides equal opportunity for desired entities. However, this ecosystem has limitations on transaction velocity since it requires consensus approval or verification from many nodes. Furthermore, blockchain contends sustainability issues since it exploits abundant energy to comply with the system, threatening the environment. This situation is alleged to be a significant obstacle to the development of blockchain.

LIMITATION AND FUTURE RESEARCH

This study recognizes two limitations. First is asymmetric preconception understanding. Because it is qualitative, conceptual understanding through coding has the potential to deviate. The researchers used the mechanism for confirming the coding results to experts and resource persons to justify the conceptualization of the findings. Second is the validity and reliability of data/information. To reduce this limitation, researchers used a research protocol on all speakers. In addition to being a standardized research instrument, this approach also improves the validity and reliability of data. This study recommends testing the proposed proposition as the output of this research discussion. Further research is recommended to observe various sectors that have the potential to use blockchain technology.

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