THE DIGITAL ECOSYSTEM RISK IN DIGITAL BANKING: A CASE STUDY

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Abstract

Rapid technological development encourages disruptive innovation that transforms the concept of the value chain into a digital ecosystem. Companies can leverage the resources of other companies as part of their value chain, without having to own them. It can generate greater risk due to external factors that cannot be controlled directly. Digital Bank Z is a digital bank with a large business ecosystem transforming from Book Bank I. They need to address these potential risks through good risk management while digital banking expansion in Indonesia is increasing rapidly. This case study aims to obtain an evaluation of how the digital transformation and risk management held by Digital Bank Z as well as to produce the conceptual framework for digital ecosystem risks. This qualitative research conducted semi-structured interviews as triangulation with informants from Digital Bank Z and Financial Services Authority or *Otoritas Jasa Keuangan* (OJK). Digital transformation produces competitive advantages for Digital Bank Z through higher interest rates, but the regulator cited, "digital bank is not a disruptor or competitor". Recently, risk management is more focusing on operational risk due to no specific regulation of digital banks yet. As recommendations, the conceptual framework provides three stages to identify the risk of collaboration and the digital ecosystem.

Keywords: Digital Transformation, Digital Ecosystem Risk, Digital Banking

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1. INTRODUCTION

The banking industry is a highly regulated business due to the inherent risk of managing third-party funds. This circumstance encourages the banking industry to have limited innovation space and keep its prudence principle. However, the rapid development of technology has created room for disruption in various business sectors, including banking. There has been a change in customer behavior that requires it to be more comfortable, convenient, faster, and safer in transactions which are accommodated by the presence of technology to increase its operational cost efficiency. Based on the Central Bureau of Statistics or *Badan Pusat Statistik* (BPS) data related to the number of banks and the number of bank offices in 2020, there was a consistent decline in the period 2018 to 2020. The number of commercial banks in 2018 amounted to 115, decreased to 110 in 2019, and 109 in 2020. Meanwhile, the number of commercial bank offices also continued to decline from 31,609 in 2018 to 31,127 in 2019, and 30,733 in 2020 (BPS, 2021).

The competition comes not only from competitors among banking companies but also from non-banking companies such as technology companies that produce financial products. Technology companies can produce financial technology (FinTech), namely technology-based applications that provide financial services such as banking. FinTech operating in Indonesia is classified into two, namely payment FinTech which is regulated and supervised by Bank Indonesia, and FinTech financing (peer to peer) which is regulated and supervised by the Financial Services Authority or *Otoritas Jasa Keuangan* (OJK). Banking and technology companies do not compete but need each other. Thus, many companies are synergizing and collaborating to form a digital ecosystem (business to business, B2B) and to integrate consumer needs.

The growth of digital banking in Indonesia escalates the complexity of risks for banking. One of the potential risks is the interest rates which can reach above 6%, while the guaranteed interest rate provided by the Deposit Insurance Corporation or *Lembaga Penjamin Simpanan* (LPS) for the last 2022 period is only 3.5%. In fact, the majority of digital banks in Indonesia come from the transformation of Book Bank I with a core capital of less than 1 trillion rupiahs. In addition, according to Gulati (1998), the use of digital technology that produces a business ecosystem can lead to multi-level embeddedness risks that are relational risk, performance risk, ecosystem characteristics risk, and risk of digital technology. Digitization pushes the boundaries of business activity to open, so relationships between companies become more open and influence each other. Companies will no longer depend on resources and capabilities that come from internal competencies but will also be greatly influenced by external competencies.

Previously, companies took advantage of the value chain through a vertical integration business strategy to generate competitive advantages. Technological advances and digitalization have pushed companies to change the concept of the value chain into a digital ecosystem. The concept of a digital ecosystem encourages companies to take advantage of other companies' resources as part of their value chain, without having them. This concept is referred to as an inverted firm, namely, the company creates value not only through an integrated value chain but creates value through many companies that are activated and regulated through a single platform (Parker, Van Alstyne, & Jiang, 2016).

Digital Bank Z is a company originating from one of the existing conglomerate businesses in Indonesia. This conglomerate business consists of various business segments across industries. In fact, basically, the conglomerate business already had business units running in the banking industry. Furthermore, this bank's business unit already consists of general banking and Sharia banking. The holding bank, called Parent Bank Y, is a large bank in Indonesia and has been classified as a Book Bank III. So far, Digital Bank Z is still greatly assisted by its business ecosystem which is owned by the conglomerate business, particularly assisted by Parent Bank Y. Meanwhile, Digital Bank Z is coming from a transformation of Book Bank I into a digital bank with a core capital of less than 1 trillion rupiahs. Nevertheless, the increase in digital banking massively in Indonesia that followed by higher interest rates was not in line with their capability of core capital. Regulators through the OJK have issued a Blueprint for Digital Banking Transformation as a guide for the transformation of banking into a digital bank in Indonesia. With their big ecosystem, it is necessary to watch Digital Bank Z's business steps and performance that potentially influenced other elements in their ecosystem. So, the following are the research questions to answer the problem statements:

RQ1: How is the evaluation of the digital transformation carried out by Digital Bank Z?

RQ2: How is the evaluation of the risk management plan from Digital Bank Z carried out in addressing the potential risks of the digital ecosystem?

RQ3: What are the recommendations of the conceptual framework for digital ecosystem risks?

Based on the background, it becomes motivational for this research to examine how the potential risks are owned by Digital Bank Z as resulting from the transformation of Book Bank I supported by one of the largest conglomerate businesses in Indonesia.

In addition, this research tried to develop a framework related to the collaboration elements that produce a digital ecosystem. Recently, there is no risk management framework related to a holistic digital ecosystem. Hopefully, this research can be a novelty due to no similar research on digital banking transformation which is strongly influenced by the business ecosystem.

The rest of this paper is structured as follows. Section 1 is the introduction that is followed up by Section 2 which reviews the relevant literature. In Section 3, this study uses case study analysis through an evaluation of the risk management planning at Digital Bank Z with criteria from the Blueprint for Digital Banking Transformation by a regulator. As result, Section 4 provides evidence including an interview to support the arguments. Section 5 contains a discussion and similar cases that have occurred to the research topic. Section 6 describes the conclusions and answers to the research questions as well as gives recommendations to Digital Bank Z and the Financial Services Authority as the regulators.

2. LITERATURE REVIEW

2.1. Disruptive innovation, financial technology, and digital ecosystem

According to Christensen (2011), disruptive innovation theory states that technology can create disruption to existing conventional businesses because it is able to provide convenience, comfort, security, and cost efficiency. Disruption describes a process by which small firms with limited resources try to compete with incumbent firms. FinTech is an industry consisting of technology-based companies with the aim of providing more efficient financial services. FinTech tries to disrupt traditional financial services using technology. The shift in customer behavior is also greatly influenced by the very rapid development of mobile smartphone technology, generation changes with

the presence of the millennial generation, and the saturation of the banking model that has persisted for the last few decades. Bank customers have four basic needs for financial services, namely for transactions, loan services, saving services, or limited financial guidance to assist in financial management. However, currently, customers need the benefits of trust that are less tangible, namely simplicity in tracing their money track record at all times (Wewege & Thomsett, 2020).

FinTech is a combination of finance and technology with innovative products based on customer-centric (Siddiqui & Rivera, 2022). The presence of FinTech changes the structure of the financial ecosystem due to collaboration between financial institutions and technology companies. The increasing innovation in the financial industry must be able to facilitate a more inclusive economy, increase the effectiveness of risk transfer, contribute to economic growth through ease of capital, to assist in accumulating savings in a more fair, stable, and secure manner (Arslanian & Fischer, 2019). The use of technology that causes the transformation of social-technical structures and relationships from non-digital artifacts to digital artifacts is called digitization (Yoo, Hendfridsson, & Lyytinen, 2010). Digitization causes a wave of value chain disaggregation from companies. The value chain is a series of activities carried out by the company internally through a combination process that forms a value chain including production, marketing, delivery, and other supporting activities that can create value for buyers of the company's products or services. These activities consist of primary activities that have the main function of creating value for buyers as well as support activities that function to support the increased performance of primary activities (Thompson, Peteraf, Gamble, & Strickland, 2020).

However, with the disruption of innovation, value chain activities do not only include activities carried out internally by a company. Some companies collaborate to separate their value chain activities by sharing resources and capabilities. Technology can present various innovative solutions that are able to close the capability gap between banking and the needs of its customers as well as industry leaders, thus becoming an opportunity for the birth of digital banking as new entrants (Eistert, Deighton, Marcu, Gordon, & Ullrich, 2013). A series of value-chain disaggregation activities have the potential to create an ecosystem in the business because collaboration between companies is increasing. Chung, Dietz, Rab, and Townsend (2020) define an ecosystem as a digital platform that cuts through the consolidation process of companies with their customers through strengthening and domination over customer needs, one way to bypass the consolidation process is by partnering.

2.2. Risk of a digital ecosystem

Risk is the impact of the uncertainty of achieving an objective or target which can be influenced by the exposure from the company's strategy and the company's environment. Corporate strategy is the most controllable factor for the company. Meanwhile, environmental factors originating from the company's internal and external environment are more difficult to control. Risk management can be applied as corrective control and incident management as a corrective reaction to reduce the impact of financial and non-financial (Chapelle, 2019). FinTech encourages the nature, complexity, and magnitude of new risks with higher characteristics, variability of characteristics, and greater spreading speed, and requires close monitoring for financial stability (Afanasiev & Kandinskaia, 2021). Digital risk is all the unforeseen consequences that come from digital transformation, thereby disrupting the achievement of the company's business goals (Kost, 2022). Digital risk is a very complex risk depending on the process of implementing technology applications by a company. Internet connection and infrastructure is external digital risk, while internal digital risk can come from systemic errors or human factors. Digital risk can be radiated by the company's business chain which then has an impact on all aspects of the company's business, so prevention and control measures are needed (Xie, 2020).

As an effort to mitigate risk, the company can carry out a risk identification and assessment process. Then, the company generally collects the identified risks into a risk list that contains risks with small to large impacts. In some cases, small risks that are considered to have minor impacts may not be strongly mitigated. However, if it occurs, a small risk with a minor impact can potentially transmit the risk to a larger risk with a significant impact. Risk connectivity that produces a cumulative impact can occur if there is a set of risks that are in the same risk cluster and influence each other causing systemic impacts (Chapelle, 2019). In a business that is increasingly complex and heavily influenced by digitalization, many companies are building a business ecosystem through interfirm collaboration. The ecosystem consists of multi-directional relationships that are influenced by the resources and capabilities of each company, so that is one of the limitations of this study. Ecosystems produce network embeddedness that can provide opportunities for companies to share resources such as access to information, market share, to infrastructure such as technology to achieve common goals (Gulati, 1998).

The digital transformation that occurred prompted the OJK as the regulator in Indonesia to develop a Blueprint for Digital Banking Transformation which aims to assist banks in creating innovative financial products/services that can meet the expectations and needs of consumers. It is hoped that this Blueprint can become the basis for banks in Indonesia to develop digitalization that is more resilient, competitive, and contributive. This Blueprint is part of Pillar 3 *"Master Plan for the Indonesian Financial Services Sector 2021–2025 (MPSJKI 2021–2025)"* and part of Pillar 2 *"Roadmap for Indonesian Banking Development 2020–2025 (RP2I 2020–2025)"*. The Blueprint has a basis for preparation that considers the environmental factors of banking strategies to identify the opportunities and challenges of digitalization through an initial assessment of the maturity level as measured by the digital maturity assessment for banks (DMAB). The Blueprint includes five elements, namely data implementation, technology, risk management, collaboration, and institutional arrangements.

2.3. Risk management and collaboration element

The Blueprint for Digital Banking Transformation emphasizes the elements of risk management on several risks that can occur when using information technology, such as outsourcing risks and cybersecurity risks. Attacks from hackers/crackers have the potential to disrupt, steal, and destroy confidential company's and customer's data, so that the implementation of risk management is emphasized on cybersecurity. In addition, banks must implement outsourcing management in terms of using third-party assistance in providing information technology. Information technology risk management (ITRM) in this Blueprint uses an approach developed by KPMG in 2019, which is a top-down, risk-based, and process-focused approach designed to be adapted to different companies and conditions (KPMG, 2022). This ITRM covers banking activities starting from the stages of planning, procurement, development, operations, and maintenance, up to the process of cessation and deletion of resources. ITRM framework includes:

1) *Risk identification:* Identifying risks on the use of IT-based on enterprise risk posture and appetite. This identification process is attached to the entity level and corporate governance in addressing the use of IT.

2) *Risk management:* Perform risk management on the use of IT in all business processes and controls in the company. Risk management can be done with an analytical approach and predictive modeling of the standards and policies owned by the company.

3) *Risk mitigation:* Carry out risk treatment processes for the use of IT on related issues and existing deficiencies. One of the mitigation efforts that can be done is to establish work procedures.

4) *Risk optimization:* Turning the risks of using IT into returns and business opportunities. Optimization is also carried out by monitoring the entire ITRM process. The implementation of risk management related to IT has been stated in the Financial Services Authority Regulation No. 38/POJK.03/2016 concerning Application of Risk Management in the Use of Information Technology by Commercial Banks (OJK, 2016).

The digital ecosystem encourages banks to collaborate and produce new business models through sharing platforms, infrastructure sharing, also to cooperation in the distribution of products and services. The collaboration or partnership can be carried out by the banking sector with bank financial institutions and non-bank financial institutions or even non-financial institutions such as technology or FinTech companies.

1) *Sharing platforms:* Collaboration in terms of sharing platforms can result in a bank acting as a provider of mobile applications consisting of financial and non-financial services, making it easier for customers to explore the digital ecosystem in one hand of the bank's application.

2) *Infrastructure sharing:* The form of cooperation in terms of sharing services through sharing infrastructure for Bank Business Groups or *Kelompok Usaha Bank* (KUB) includes the use of application technology, data centers, or data recovery centers to encourage operational efficiency.

3) *Product and service distribution cooperation:* Banks can expand access to customers through distribution and product offerings, for example through channeling schemes, referral schemes, payment system schemes, providing escrow/cash management for peer-to-peer lending, and providing access to data through open application programming interfaces (APIs).

3. RESEARCH METHODOLOGY

The method of this study is a qualitative method using a case study analysis approach. This study evaluates the risk management planning at Digital Bank Z with the criteria of risk management elements and collaboration elements from the Blueprint for Digital Banking Transformation. Cases are past events that can be lessons for the present. A case is an analogue of reality or an avatar that has four characteristics, namely (Ellet, 2018):

1) a significant business issue,

2) having sufficient information to form the basis of a conclusion about a problem,

3) does not have an objective conclusion, in other words, does not give the correct answer explicitly or implicitly,

4) a nonlinear organization, cases must have a logical structure.

This study used primary data from a risk management framework and a recent annual report from Digital Bank Z. In addition, an interview was conducted with Digital Bank Z, with informant Mrs. X as Head of Enterprise, Operational, and Market Risk, as well as the OJK, with informants from the Department of Banking Research and Regulation or *Departemen Penelitian dan Pengaturan Perbankan* (DPNP), and Deputy Director of the Indonesian Banking Architecture as the regulator in assessing the systemic risk of the digital ecosystem owned by digital banks. According to Ellet (2018), an evaluation scenario-based case study is to gain an in-depth understanding of a proposition before making a particular decision or action.

Based on an inclusive and pluralistic view, each research method can be used for three purposes, namely exploratory, descriptive, and explanatory studies (Yin, 2018). In this study, Digital Bank Z is an exploratory object that functions to generate a proposition, namely the risk of the digital ecosystem. Meanwhile, the OJK is an explanatory object that functions to test the proposition of digital ecosystem risks. So, the purpose of writing this study is to provide benefits for developing policies and strategies for the research's objects as well as recommendations on building the conceptual framework of digital ecosystem risks. So, this research is expected to be able to improve and maintain the financial system stability in Indonesia.

4. RESULT

4.1. The digital transformation of Digital Bank Z

Disruptive innovation encourages many companies to disrupt the banking business model. Disruption to the banking business model does not only come from fellow banking companies but also non-banking companies such as technology companies. However, along with the regulation, technology companies cannot directly build a bank business unit. So, in the end, there was a phenomenon of

non-banking companies transforming into banking companies through digitalization. So, they can run a digital banking business. Plenty of digital transformation phenomena come from small banks which are included in the category of Book Bank I with core capital coverage of less than 1 trillion rupiahs to turn into digital banks. Included in this research, the object of Digital Bank Z is the result of the transformation from a Book Bank I into a digital bank.

Mrs. X, an informant from Digital Bank Z in this study, stated that Digital Bank Z originated from a Book Bank I. Initially, Digital Z Bank was formed by a conglomerate company that previously had several other commercial banks, including Parent Bank Y which also has Islamic Bank Y. In terms of the transformation carried out, at the initial stage, Parent Bank Y was the party that mostly intervened in building Digital Bank Z. This was due to inadequate human resources in the previous Book Bank I. Mrs. X said:

"At the beginning of its formation, the previous bank that was in Book Bank I was inadequate in terms of human resources, including risk management, there were no people. There is only one director, me, and the one who manages the cyber risk. However, the needs of HR had been fulfilled this year [2022], because we have a big target in business and the initiative is very high".

The digital transformation by Digital Bank Z is in line with the theory related to the disruption of innovation which states that disruption creates threats to business from incumbent companies. Digital banks can produce more effective and efficient business operations compared to conventional banks. Following the definition of Financial Services Authority Regulation No. 12/POJK.03/2021 regarding Commercial Banks (OJK, 2021), a digital bank is a bank whose activities are without a physical office or a limited number of physical offices, resulting in lower operational costs for digital banks. It encouraged digital banks to provide higher savings and deposit interest rates compared to conventional banks. In fact, the interest rate from digital banks has a higher value than the LPS guarantee interest rate of 3.5%. With such low business operations, Digital Bank Z can provide savings and time deposit interest rates through applications with much higher interest rates than conventional banks. In general, conventional banks currently provide savings and deposit interest rates of around 2–3%, but several digital banks including Digital Bank Z can provide higher interest rates of around 4%. Even some of the other digital banks can provide interest rates that reach more than 7%. Table 1 shows the phenomenon of the transformation of several Book Bank I into digital banks along with information on interest rates for savings and time deposits.

Table 1. The interest rate of digital banking in Indonesia

No.	*Digital bank*	*Previous bank*	*Interest rate*	
			Savings	*Deposits*
1.	Digital Bank Z	Book Bank I Z	4%	6%
2.	Digital Bank Y	Book Bank I Y	3.5%–4%	3.5%–4%
3.	Digital Bank X	Book Bank I X	6%	7%

Source: Author's elaboration.

Regarding interest rates, Mrs. X stated:

"One of our products is a time deposit with a higher interest rate than conventional commercial banks, which is only around 2–3%. The interest given by Digital Bank Z can reach 4.5%. However, this interest is still relatively small when compared to several competing digital banks which can reach 6–7%. This is because we are just launching".

Based on this phenomenon, digital banks in Indonesia have savings and time deposit rates that exceed the conventional commercial banks' interest rates, even exceeding the guaranteed interest rate of 3.5%. Referring to Government Regulation of the Republic of Indonesia No. 66 of 2008 "Amount of Deposit Value Guaranteed by the Deposit Guarantee Institution", deposits guaranteed by LPS are only up to 2 billion rupiahs per customer per bank, provided that the interest rate is equal to or less than 3.5%. This means that although the three digital banks above have become LPS' participating banks, their interest rates exceed the guaranteed provisions of 3.5%. Mrs. X also stated the same thing that the guaranteed interest rate is only 3.5% and the rest will be borne by Digital Bank Z. In fact, the status of digital banks in Indonesia is a bank that comes from the digital transformation of Book Bank I. The capital of digital banks in Indonesia is still very small, which is less than 1 trillion rupiahs.

This circumstance encourages the market risk that comes from digital bank interest rate risk. In addition, this could potentially pose a liquidity risk, due to the low capital adequacy of digital banks. The facts show that the three digital banks have been a rapid growth in the number of customer deposits at Indonesian digital banks which is very significant from 2020 to 2021. Based on the results of data processing using a sample of three digital banks in Indonesia in Table 2, it is obtained the fact that the average growth of the three digital banks reached 463.6%. This indicated that digital banks are experiencing very rapid growth and trust from the public. Meanwhile, the core capital adequacy status of the three digital banks is still Book Bank I.

Table 2. The growth of digital banking customers in Indonesia

Digital bank	*Deposits from customers and related parties (in million, rupiah)*				*Growth*
	2021		*2020*		
	Savings	*Deposits*	*Savings*	*Deposits*	
Digital Bank Z	103.662	1.854.722	107.293	1.178.111	
Total	1.958.384		1.285.404		152.4%
Digital Bank Y	1.299.875	1.889.980	35.881	585.278	
Total	3.189.855		621.159		513.5 %
Digital Bank X	5.784.356	564.774	168.898	707.004	
Total	6.349.130		875.902		724.9%
Average growth					**463.6%**

Source: Author's elaboration.

In a theory, digital banking became a disruptive innovation that disrupts conventional banking, but OJK stated that digital banks are not disruptors or competitors. Through interviews conducted with OJK with informants from the Department of Banking Research and Regulation, the Deputy Director of Banking Architecture stated that:

"OJK and the financial industry, especially banking, view that the presence of FinTech is not seen as a disruptor or competitor. The presence of FinTech needs to be utilized so that banks can provide financial services better and meet customer expectations. OJK stated that future collaboration will be the key to the development of digital ecosystems".

The regulator believes that FinTech and banking have a mutually beneficial bilateral relationship. This is because the collaboration is aimed to meet the customer's expectations. The relationship is encouraged by each party having advantages that can complement each other. Banking parties have advantages, namely having a basis for maintaining the confidentiality of consumer data, expertise in governance and risk management as well as in developing innovative financial products. Banks also have loyal customers, access to personal relationships with consumers, and reputation and trust from consumers that have been built earlier. However, FinTech companies also have several advantages, namely being able to adopt the latest technologies faster and more flexibly in carrying out technological development literacy according to consumer needs.

The OJK stated that the mutually beneficial relationship between banking and financial technology must be balanced with the principle of prudence so the regulator has written a Roadmap for this matter:

"With the collaboration, banks and FinTech can take advantage to develop either market access or market share; access to resources (such as data, technology, or knowledge); new products; as well as the development of new technologies so that they are mutually beneficial, able to provide the best service to consumers, and encourage the development of the digital economy. Therefore, OJK encourages collaboration between banks and other companies, including FinTech, while still paying attention to the prudent aspect. The encouragement for this collaboration has been stated in the Roadmap for the Development of Indonesian Banking 2020–2025 as well as the Blueprint for Digital Transformation".

4.2. The Digital Bank Z's risk management

The increasing growth and business expansion encourage more risks Digital Bank Z may face. Therefore, Digital Bank Z needs to plan and implement good risk management to minimize the impacts of risks that may occur. Currently, Digital Bank Z already has a risk management framework that supports the creation of a corporate image, identity, and culture within the company. The risk management framework starts by building the foundation that comes from stakeholder roles and beliefs, namely the expectations of the stakeholders involved in business activities at Digital Bank Z. The stakeholders consist of employees, shareholders, customers, vendors, regulators, and public. Digital Bank Z strives to implement risk management that accommodates the expectations of these stakeholders. Thus, Digital Bank Z plans for good corporate governance which consists of corporate culture and values as well as corporate vision, mission, and strategy. The following is a statement from Mrs. X regarding the implementation of governance at Digital Bank Z:

"Governance in risk management at Digital Bank Z has two levels of committees, namely directors and commissioners. I belong to the secretariat of the risk management committee which meets every month. Members consist of all directors, and participants consist of related divisions that experience incidents. If there is an incident, the participants will make a presentation through this committee. There are also reports related to risk. In addition, there is a credit committee, and there is a digital board to discuss digital credit".

In addition, the risk management framework of Digital Bank Z has a risk management plan based on the four-pillar strategy with reference to enterprise risk management portfolio and capital risk management. The four-pillar strategy consists of:

1) *Organization structure and human capital:* In risk management planning, Digital Bank Z is led by a Director of Risk, Compliance, Human Capital, and Legal. In carrying out its functions, the Director is assisted by Enterprise, Operational & Market Risk, Cyber Risk Head, and Credit Risk Head.

2) *Policy and procedure:* In risk management planning, Digital Bank Z has pillars of policies and procedures consisting of major policies, sub-policies, and guidelines and procedures. Major policies consist of various main policies from risk management, which are related to credit, operations, liquidity, market, reputation, compliance, legal, and strategy. Then, the sub-policies consist of the capital adequacy ratio (CAR) or *kewajiban penyediaan modal minimum* (KPMM) policy, stress testing, risk limits, outsourcing risk management, and business continuity management policy. Meanwhile, the guidelines and procedures consist of various guidelines and procedures, for example, related to operational risk management guidelines, risk control self-assessment (RCSA) procedures, incident report and management procedures, key risk indicator procedures, guidelines for preparing risk profiles, incident response protocol, communication tree established, Circular Letter or *Surat Edaran* (SE) appointment of a responsible person, product risk management guide, liquidity coverage ratio (LCR), standard operating procedure (SOP), net stable funding ratio standard operating procedure (NSFR SOP), and market risk management guideline.

3) *System and data:* The pillar of system and data risk management is based on the risk database which includes credit risk management, operational risk management, market and liquidity risk management, and cyber risk management.

- Credit risk management consists of T24 loan origination, credit scoring, credit rating system (CRS), and risk limits.
- Operational risk management consists of a loss event database, RCSA, risk limits, and key risk indicators.
- Market and liquidity risk management consists of manually by Excel, market and liquidity risk monitoring, mark-to-market, and risk limits.
- Cyber risk management consists of an IT risk register, incident response protocol, IT risk governance, and risk limits.

4) *Methodology and approach:* The methodology and approach to risk management at Digital Bank Z cover four areas, namely credit risk management, market risk management, liquidity risk management, and operational and cyber risk management. This refers to the four most significant risks potentially faced by Digital Bank Z, namely credit risk, market risk, liquidity risk, and operational risk.

The risk management framework that has been built is expected to encourage the achievement of shareholders' values (capital management) through a corporate image, identity, and culture. Shareholders' value at Digital Bank Z consists of:

- Profitable bank: Based on the 2021 Financial Statements, Digital Bank Z has had a profit that increased from 2020 to 2021. In 2020, Digital Bank Z had a profit of 37,011,391,337 which increased in 2021 to 192,474,618,193. This means that there is a very significant increase in profit by 520%.
- Best asset quality bank: Based on the 2021 Financial Report, Digital Bank Z has increased its total assets from 2020 to 2021. In 2020, Digital Bank Z has total assets of 2,586,663,487,991 which increased in 2021 to 4,649,357,148,732. This means that there is an increase in total assets by 179.74%.
- Bank with sustainability: Sustainability in this case is Digital Bank trying to create a sustainable organization by maintaining a strong capital position. This is achieved by expanding the business and retaining investors, depositors, customers, and market confidence.

However, according to the OJK, digital banks are banks that have a digital business model. Therefore, digital banks are also subject to commercial bank regulations. The OJK stated that:

"First, OJK does not view digital banks as fintech. Digital Bank is not a company with new types of financial services like FinTech (P2P, e-commerce, and others). Second, the bank is a bank regardless of the business model. Digital banks are only commercial banks that have a digital business model. OJK does not dichotomy between conventional banks and digital banks. Digital banks and conventional banks are subject to the same rules, namely the rules of commercial banks. Thus, the rules for establishing a digital bank are the same as for the establishment of a commercial bank. Third, until now there has been no establishment of a new digital bank, let alone a digital bank from a technology company".

4.3. The evaluation of Digital Bank Z's risk management elements

Digital Bank Z has implemented risk management which refers to the Financial Services Authority Regulation No. 38/POJK.03/2016 concerning Application of Risk Management in the Use of Information Technology by Commercial Banks (OJK, 2016). The scope of risk management related to IT refers to four main pillars or points (Table 3).

Table 3. Information technology risk management's evaluation of Digital Bank Z

No.	*Scope of ITRM*	*Description*
1.	Active supervision from the board of directors and the board of commissioners	Digital Bank Z has carried out active supervision through an official meeting of the risk monitoring committee which is held every three months. in addition, the relationship with the commissioners is closely intertwined, because they can be in direct contact with the commissioners at any time in the workroom.
2.	Policies, standards, and risk management procedures for the use of IT	Digital Bank Z has policies and procedures consisting of three main points, namely major policies, sub-policies, and guidelines and procedures.
3.	Risk management process related to IT	Digital Bank Z has carried out the risk management process related to IT through data management and systems that refer to the risk database. In fact, this risk database does not only cover IT, but also comprehensively consists of credit risk management, operational risk management, market and liquidity risk management, and cyber risk management.
4.	Internal control system and internal audit for IT implementation	Internal control at Digital Bank Z uses the three lines model, a more updated concept than the three lines of defense. By using the concept of the three lines model, the relationship between the first line and the second line becomes closer, so that it is more responsive in taking actions and decisions.

In addition, Digital Bank Z already has four pillars of strategy in carrying out risk management planning. The following is an evaluation of the four-pillar strategy based on the results of interviews with Mrs. X, namely:

1) *Organization structure and human capital:* The planning for organizational structure and human resources at Digital Bank Z has been carried out efficiently because it does not involve a lot of human resources. This is due to the business model of a digital bank that is more efficient in carrying out its operational activities. Digital banks can operate without branch offices located in each area. So, this circumstance encourages very significantly in reducing the number of human resource needs.

2) *Policy and procedure:* The planning of policies and procedures that are prepared refers to the business activities of Digital Bank Z, namely digital and non-digital businesses. Currently, Digital Bank Z still relies on non-digital business performance:

"Digital businesses must still have a boost from non-digital businesses. In May, it already had a profit because it was supported by non-digital businesses, such as corporate loans which value could reach trillions of rupiah, the debtors were not many, but the value was large. So, it can be used to finance digital businesses. As the business grows, the risk management must also follow the growth".

3) *System and data:* System and data planning that refers to database risk is still not perfect, because it is still in the development stage. Several aspects of the system and data management at Digital Bank Z do not yet have their own system:

"The system and data have been partially developed. For example, there is already credit scoring, collection, and credit rating, for debtors there is loan origination and treasury. However, there is no separate system for enterprise and cyber operations. Market risk will gradually be developed because currently, the main focus of digital banks is the operational risk (including cyber)".

4) *Methodology and approach:* The planning methodology and approach used in risk management at Digital Bank Z is quite complete with

reference to four critical aspects, namely credit risk, market risk, liquidity risk, and operational and cyber risk. However, the methodology and approach used are still in the design and development stage. In addition, currently, Digital Bank Z is still focused on the implementation of operational and cyber risks which refers to the digital bank business model:

"The methodology of risk management is gradually being set by setting policies and working tools such as RCSA to find out what risks are related to digital banks. In addition, there is also a key risk indicator (KRI) to determine events that must be considered. There is also social media monitoring because digital banks pay more attention to customer complaints due to the absence of branch offices. Digital bank call centers are different from conventional commercial banks because here they focus more on managing social media such as WhatsApp and comments on Instagram".

4.4. The evaluation of Digital Bank Z's collaboration elements

Based on the Blueprint for Digital Banking Transformation, banks can collaborate with various parties, including non-banking parties. Digital Bank Z as part of a conglomerate business has various affiliated relationships with several other companies. In fact, the collaborative relationship is not only limited to fellow conglomerate companies, but also to the structure of Digital Bank Z's shareholding which consists of various investors. Many of these investors come from digital companies, such as e-commerce and online ticket booking platforms, even one of the largest retail companies in Indonesia. In addition, Digital Bank Z has partnered with several merchants to expand their business collaboration. With the expansion of business partners, Digital Bank Z has driven collaboration into the surrounding business ecosystem. Digital Bank Z has a digital business model so the ecosystem turns into a digital ecosystem.

The digital ecosystem produces benefits and strengths for companies to encourage competitive advantages. Companies can synergize with each other to form separate value chains (value chain disaggregation). In fact, the synergy is not limited to a similar business environment in banking industries but can be carried out across businesses with an unlimited coverage area. This circumstance increases the company's opportunity to capture a much wider market share. With the increasing business expansion of the digital ecosystem, there is also increased risk potential. According to Mrs. X, the digital ecosystem risk has been classified as a strategic risk faced by Digital Bank Z. The following is an evaluation of the collaboration elements of Digital Bank Z which refers to the Blueprint for Digital Banking Transformation:

1) *Platform sharing:* Digital Bank Z provides a platform sharing that can be used in various business ecosystems to integrate customer needs into one mobile application service. So far, the impact of the platform sharing that is felt by customers is its connection with the various conglomerate businesses. In addition to its own mobile application, Digital Bank Z also has a platform sharing that collaborates with one of the e-commerce affiliations. The e-commerce party developed a shopping application for grocery shopping with a quick commerce concept by utilizing the retail business network from the conglomerate business.

2) *Infrastructure sharing:* The form of cooperation in terms of sharing services through infrastructure sharing for KUB covers the use of application technology, data centers, or data recovery centers to encourage operational efficiency. As a transformation from Book Bank I, Digital Bank Z's infrastructure is still limited. Thus, Digital Bank Z collaborates a lot with affiliated banks in their conglomerate business structure. Parent Bank Y acts as the coordinator bank or chairman of the KUB. Therefore, Digital Bank Z still does a lot of coordination and reports to Parent Bank Y to provide integrated risk management in the conglomerate business.

3) *Product and service distribution cooperation:* Digital Bank Z has actively collaborated with various merchants, both those included in the conglomerate business and with other external parties. Especially, for merchants which are included in the conglomerate business, they get more discount programs or additional cashback. Payments to merchants can be made directly using the Indonesian Standard Quick Response Code (QRIS). Digital Bank Z also provides a Pay Later facility with a limit of up to 100 million rupiahs, although according to Mrs. X the maximum limit is only 30 million rupiahs. In addition, Digital Bank Z already has programs related to top-ups from various channeling at free costs. Digital Bank Z also has a BI (Bank Indonesia) Fast service that offers a free transfer program to other banks. Digital Bank Z can also make cash withdrawals without an ATM card at Bank Parent Y.

In the business collaboration, Digital Bank Z has carried out a risk management plan in the form of integrated risk management to accommodate the conglomerate business:

"We include digital ecosystem risks as part of strategic risk. We have integrated risk management because it is part of our conglomerate business. According to the regulator, the conglomerate business is required to be reported as conglomeration risk. Parent Bank Y becomes the bank coordinator or chairman of our Bank Business Group (Kelompok Usaha Bank — KUB)".

Digital Bank Z has its own division to mitigate the risks related to the digital ecosystem, namely the Digital Acquisition division. This division is generally tasked with overseeing work related to the ecosystem or commonly referred to as the business unit. Although the main task is sales, this division is also responsible for projects related to the ecosystem or business collaboration. This division coordinates a lot with the parent company of the conglomerate. So far, the risk management framework used to manage digital ecosystem risk at Digital Bank Z is through the RCSA. Mrs. X stated that there was no regulatory framework or regulations governing this matter:

"We only use the RCSA, because the regulations themselves do not exist yet. There may still be a gap of knowledge because regulation takes time to understand these phenomena. So far, we have more focused on the operational risk issues related to cyber risk".

The regulator stated that digital banks are commercial banks that have a digital business model, so regulations still use the same regulations as commercial banks. In conducting the assessment, the regulator considers the following:

"First of all, the bank's assessment is carried out through an assessment of the Bank's Soundness Level using a risk approach (risk-based on bank rating). Thus, the assessment of bank soundness does not depend on digital and non-digital business models. Secondly, one of the factors in assessing the soundness of a bank is the bank's risk profile which includes credit risk, operational risk, market risk, liquidity risk, legal risk, strategic risk, compliance risk, and reputation risk. Risks related to digitalization or risks related to information technology are currently one of the components of operational risk assessment. Last, digital maturity level assessment or digital maturity assessment for bank only measures the extent of bank maturity in managing risks that accompany digital transformation or IT-related risks. The results of the DMAB assessment will be a factor for consideration of the operational risk profile and subsequently the level of bank health".

Digital Bank Z based on its Annual Report has four main risks covering credit risk, market risk, liquidity risk, and operational risk. Meanwhile, one of the business ecosystems within Digital Bank Z, the e-commerce company has different main risks including credit risk, market risk, price risk, foreign currency risk, and liquidity risk. So, Digital Bank Z and e-commerce that are in one ecosystem have the same three main risk clusters including credit risk, market risk, and liquidity risk. In the same three clusters, there is a potential for connectivity risks that can infect each other. However, connectivity risk is not limited to risks in one cluster. In response to this, Digital Bank Z has carried out risk grouping through the risk register using the RCSA:

"Risk grouping is carried out through a risk register that has been developed since July 2022 in all divisions. The risk register used the Risk Control Self-Assessment (RCSA) which is like a template to reduce all processes and risks that are significant. Then, an assessment of the risk is carried out whether it is high, medium, or low. After that, we control the risk to minimize the impacts".

Meanwhile, OJK as the regulator views this connectivity risk as a systemic risk that has been regulated by the determination of systemic banks in the Financial Services Authority Regulation No. 2/POJK.03/2018 concerning Determination of Systemic Banks and Capital Surcharge (OJK, 2018). Every bank whether directly or indirectly integrated into a digital ecosystem will still have the potential to be exposed to systemic risk if it has interconnectedness:

"OJK understands the connectivity risk you mean as a systemic risk. Systemic risk is the potential for instability due to the contagion in part or all of the financial system along the interaction of size factors, business complexity, inter-institutional and/or financial market linkages (interconnectedness), as well as the excessive behavioral tendencies from financial actors or institutions, to follow the economic cycle (procyclicality)".

4.5. The risk ecosystem in Digital Bank Z

Digital Bank Z has various business partners from its conglomerate business ecosystem. These business partners come from various business segments and across industries that mutually support one another. Business partners are not only from conglomerate business units but also from external companies that work together through investing in shares or other forms of direct cooperation. Each business unit or company within the Digital Bank Z ecosystem has different risks and policies. Several business partners from different industries have focused on risk management policies in different areas according to the capabilities of each company. The following is an overview of risk management policies based on focus areas in several sample business partners within the Digital Bank Z ecosystem:

Table 4. Risk ecosystem in Digital Bank Z

No.	*Company*	*Key risks*	*Connectivity risks*
1.	Digital Bank Z	Credit risk	Credit risk and liquidity risk
		Market risk	
		Liquidity risk	
		Operational risk	
2.	E-Commerce X	Credit risk	Credit risk and liquidity risk
		Market risk	
		Pricing risk	
		Exchange risk	
		Liquidity risk	
3.	Parent Bank Y	Credit risk	Credit risk and liquidity risk
		Market risk	
		Liquidity risk	
		Operational risk	
4.	Media and Entertainment W	Strategic risk	Credit risk and liquidity risk
		Financial risk	
		Credit risk	
		Liquidity risk	
		Security risk	
		Property risk	
		IT risk	
		Legal risk	
		Reputational risk	

Source: Author's elaboration.

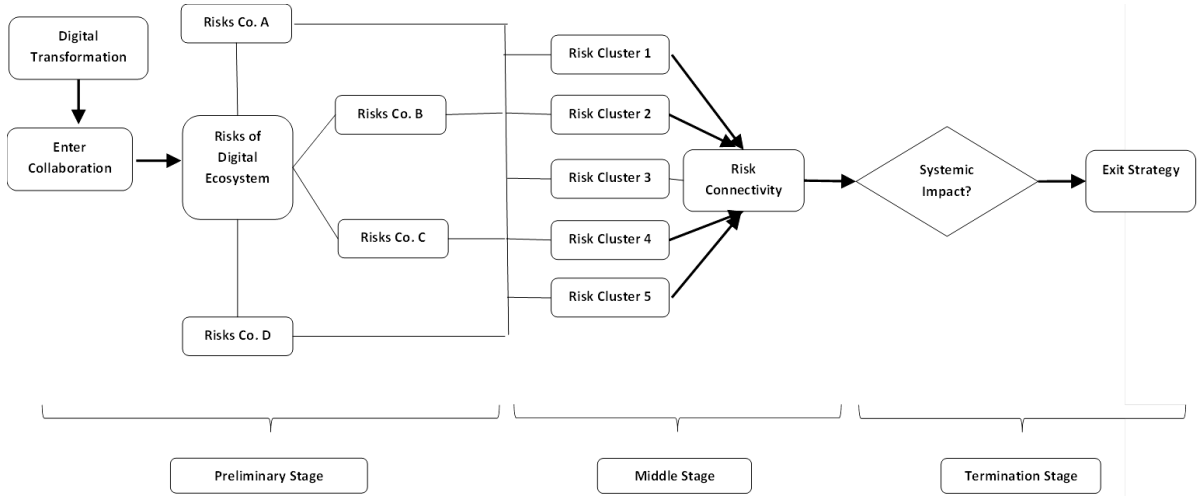
Based on Table 4, business partners which are in the same Digital Bank Z ecosystem have different focus areas on key risks. However, based on the risk cluster policy for each company, there are the same risks and areas of focus, namely credit risk and liquidity risk. Credit risk and liquidity risk have the potential to become risks that can affect each other in each company so they become connectivity risks. If the connectivity risks can have a systemic impact, then the company needs to carry out a mitigation plan in the form of an exit strategy to release the relationship or connectivity from these risks. Nonetheless, the systemic risk may originate from other risks not previously identified as connectivity risks.

4.6. The conceptual framework for digital ecosystem risk

Based on the above phenomenon, this study seeks to present a conceptual framework related to digital ecosystem risks that refer to the collaboration element of digital transformation. The collaboration of several companies that form a digital ecosystem

generates the idea that every company has different risks. However, in each of these companies, it is possible to have the same type of risk or be in the same risk cluster, thus, producing a proposition in the form of risk connectivity that connects several risks from each element (company) in the digital ecosystem. If the connectivity risk results in a significant adverse impact and is transmitted to other elements (companies) in a digital ecosystem, then other elements (companies) need an exit strategy. The exit strategy aims to escape the significant negative impacts that come from the digital ecosystem. Figure 1 shows the conceptual framework recommendations for digital ecosystem risks.

Figure 1. The conceptual framework recommendations for digital ecosystem risk



Source: Author's elaboration.

This conceptual framework explains how a company must pay attention to the risks of the digital ecosystem in entering business collaboration. In collaboration, companies will connect with plenty of business partners across the ecosystem. The ecosystem consists of parties that have a direct relationship and parties that do not have a direct relationship. So, there will be two risks that come from internal and external factors. The risks from each company will be aggregated into one ecosystem risk that can affect other companies. In the preliminary stage, this conceptual framework states that companies in the early stages must consider and identify business partners, either with parties who have direct relationships or with parties who do not have direct relationships.

In the next phase (middle stage), the company classifies the risk from each company whether there is the same type of risk into several risk clusters. Then, the company must identify and analyze whether there are risk clusters that have connectivity or connection with one another. If the risk cluster has connectivity, the company must determine whether the connection will have a direct or indirect impact. After that, the company must assess the impact given by the risk connectivity that occurs. Impact assessment, for example, is classified as high impact, medium impact, and low impact. Furthermore, the company must assess whether the impact generated by risk connectivity has a systemic impact or not.

The systemic impact is the impact produced by a risk connectivity originating from a risk cluster. The risk cluster consists of several companies, so the resulting impact can affect each other in each company. In some cases, there may be a possibility that strong risk connectivity has a low systemic impact. On the other hand, there is also the possibility that low-risk connectivity has a strong systemic impact. Therefore, the company must mitigate several possible scenarios that can occur. In the worst-case scenario, the company must prepare an exit strategy to get away from an ecosystem. The exit strategy is the company's effort to untie the ties of an ecosystem, for example, through cooperation contracts or reduce the impact resulting from systemic impacts that occur.

5. DISCUSSION

Based on previous research related to risk management in digital ecosystems which are still very limited in national or global scope, there was an effort to develop a conceptual framework related to this. The development of the conceptual framework is carried out using the theory-building method derived from cases or "theory building from cases". Cases can be used to build a theory if there is no theory that discusses the phenomenon, or if the phenomenon is problematic. The development of a conceptual framework aims to discover new theories or to elaborate on existing theories. In this method, a theory is a combination of constructs, propositions that connect several ideas and theoretical arguments that can explain why these propositions can be used as a basis for explaining a general phenomenon (Eisenhardt, 1989).

In testing the conceptual framework of digital ecosystem risk, a validity strategy is carried out whether the tested can be generalized, logically coherent, and empirically valid. The confirmation is done by showing that the developed concept when carried out with the same procedure can produce the same results repeatedly. In this case study, a case study protocol will be carried out to ensure the reliability of the conceptual framework that is being developed. The case study protocol is carried

out by determining whether the risks of companies that have reciprocal ties will result in risk connectivity if there are interconnected risk clusters. Connectedness can be seen from the degree of influence produced by each other. In addition, benchmarking can be used against systemic cases that have occurred. It can be ascertained that previously there has been a systemic case originating from a risk cluster based on region. The case was the monetary crisis in 1998 which was caused by a contagious crisis in one Southeast Asian region (cluster).

6. CONCLUSION

Disruptive innovation encourages the phenomenon of technology companies or other non-banking companies to disrupt the conventional banking business model. The disruption produces the transformation of Book Bank I to Digital Bank. The results of the transformation of Digital Bank Z produce competitive advantages through higher savings and deposit interest rates than conventional banks. This circumstance resulted in a very significant growth in the number of customers. However, the regulator considers that digital bank is not a disruptor or competitor. Regulator treats digital banks as same as other commercial banks, but digital banks only differ in terms of their business model. The banking and FinTech industries are expected to consolidate and strengthen capital as well as accelerate the transformation of digital banks in Indonesia.

Based on the evaluation of the planning and the implementation of risk management at Digital Bank Z, the results indicated good risk management planning and implementation following applicable regulations. In carrying out digital transformation, Digital Bank Z has done well which refers to the criteria for the Blueprint for Digital Banking Transformation. However, Digital Bank Z does not have a focus on digital ecosystem risk issues yet, because they more focus on operational risks. Even though Digital Bank Z is still very much supported by its ecosystem, especially related to its non-digital businesses. In addition, the regulator also does not have regulations that specifically regulate digital banks yet. In dealing with the potential risks of the digital ecosystem, regulations still refer to the potential for systemic risks in the Financial Services Authority Regulation No. 2/POJK.03/2018 concerning the Determination of Systemic Banks and Capital Surcharges (OJK, 2018).

Changes in technology and digitalization that encourage banks to carry out various collaborations through an ecosystem must be addressed with good risk management. Interconnected activity and support along companies lead to an increase in the potential for various risks. This study provides a conceptual framework for digital banking to address the potential risks of the digital ecosystem. In the preliminary stages, banking should analyze the components of the ecosystem. Then, the middle stage encourages banking to analyze the risk clusters and the risk connectivity along its ecosystem. In the termination stage, banking needs to carry out various mitigation efforts and analyze the potential of systemic risks. This is very useful to prevent the crisis coming from systemic risks as well as to support the financial system stability in a country.

This study had limitations to the number of research objects due to the limited existing digital banking in Indonesia. The conceptual framework of digital ecosystem risk that resulted in this study needs more validation from other objects and other informants. Also, this study needs a quantitative research methodology as future research to provide the correlation between the connectivity risks of each element in one ecosystem. Future research is expected to obtain data directly from various objects.

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