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RISK MITIGATION STRATEGIES IN THE IMPLEMENTATION OF DIGITAL BANKING TECHNOLOGY: A CASE STUDY OF BANK X IN INDONESIA

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Abstrak

Penelitian ini bertujuan untuk mengetahui praktik mitigasi risiko implementasi tehnologi digital di Bank X. Penelitian ini merupakan penelitian kualitatif studi kasus pada Bank X yang mendapatkan penghargaan karena layanan digital terbaik. Data primer yang digunakan dalam penelitian ini berasal dari hasil wawancara dan observasi, sedangkan data sekunder berasal dari dokumentasi perusahaan tentang upaya mitigasi risiko. Tahapan analisis data adalah data reduksi, penyajian, dan penarikan Kesimpulan. Hasil penelitian menunjukkan bahwa pengguna internal dan eksternal Bank X memanfaatkan tehnologi digital yang berbeda. Bagi pengguna internal digital bank digunakan untuk hampir semua kegiatan operasional, sedangkan bagi pihak eskternal digunakan untuk memudahkan transaksi. Bank X melalukan mitigas risiko yang cukup intensif untuk menghindari kejahatan cyber atas penggunaan tehnologi. Penelitian ini dilakukan di Bank X yang hanya memotret kondisi implementasi teknologi digital di Bank X. Penelitian berikutnya dapat melakukan pengujian multikasus untuk mendapatkan hasil yang lebih general di beberapa perbankan syariah.
Kata kunci: Mitigasi Risiko, Bank Syariah, Tehnologi Digital

Abstract

This study aims to determine the risk mitigation practices in implementing digital technology at Bank X. This research is a qualitative case study of Bank X, which received the best digital services award. The primary data used in this study were obtained from interviews and observations, while the secondary data were obtained from company documentation on risk mitigation efforts. The stages of data analysis were data reduction, presentation, and conclusion–drawing. The findings reveal that both internal and external users of Bank X utilize different digital technologies to access banking services. For internal users, digital banking is employed for nearly all operational banking activities, whereas external users leverage it to facilitate transactions for both individual and institutional customers. Bank X implements intensive risk–mitigation measures to prevent cybercrimes associated with technology use. This study was conducted at Bank X, which only captures the implementation of digital technology at Bank X. Future studies could conduct multi–case testing to obtain more general results across Islamic banks.
***Keywords**: Risk Mitigation, Islamic Bank, Digital Technology*

INTRODUCTION

Two factors that have led to the rapid development of technology in various sectors in Indonesia are the equalization of infrastructure and the increasing use of community technology (Cahyolaksono et al., 2021). These two factors have made all sectors, including banking, experience very significant digitalization developments (Hafizh et al., 2025; Harahap, 2025). The banking sector, which is one of the sources of economic growth in Indonesia, implements technology to facilitate customers in making transactions through mobile banking, Internet banking, and similar digital technologies (Febiantoro et al., 2024). Not only for customers, digital technology is also beneficial for banks to simplify operational procedures, and increase efficiency and effectiveness (Lubis et al., 2025).

These benefits can change the banking landscape into four categories (Ngamal & Perajaka, 2022). The first change is the change in customer expectations from conventional banking practices to digital ones that are easy, safe, and in accordance with the latest developments (Ngamal & Perajaka, 2022). The second change is the utilization of big data to improve the quality of products and services through the emergence of new business opportunities and categories (Ngamal & Perajaka, 2022). The third change is the banking

function as a key player in the digital ecosystem to support other sectors (Ngamal & Perajaka, 2022). The last change is the change in the digital banking operational model to support increased profitability, inclusiveness, and banking (Ngamal & Perajaka, 2022).

The changing landscape requires banks to mitigate risks to maintain the confidentiality and security of customer data. The confidentiality and security of customer data is an important issue because banking is the sector that is the main target of cybercrime, and previous research states that the increased risk of banking cybercrime is 87.2% (Hassandi et al., 2025). Ironically, Indonesia ranks fifth among Southeast Asian countries with the highest cybercrime potential (Hassandi et al., 2025). Banking data are relatively complete compared to data from other sectors because they show not only personal data but also the financial data of customers. Cybercriminals can use this data to commit criminal acts such as theft, identity forgery, and extortion (Azmi et al., 2024).

The assessment of the digital maturity level of both conventional and Sharia banking according to Financial Services Authority (FSA) in 2022 is 43%, which shows the weakness of banking digital risk management (Fajri & Violita, 2023). This lack of digital risk management can increase the risk of cybercrime from both internal and external banking institutions. Therefore, this study aims to analyze the risks of implementing digital technology in Islamic banking, especially at Bank X. This research fills the void of a comprehensive discussion of issues regarding the risks and ways taken by the Company to minimize the risks of implementing digital technology in Islamic banking that previous studies have rarely conducted. For example Hassandi et al. (2025) study only mapped the Bank's risk mitigation in general.

RESEARCH METHOD

This research is a qualitative case study to determine the implementation of risk management in the development of Islamic banking digital technology. Case studies provide a complete and comprehensive picture of the research site (Djalaluddin et al., 2023; Fajri & Violita, 2023; Kholilah et al., 2022). This research was conducted at X Islamic banking, which for three consecutive years has been the Islamic banking with the highest level of customer satisfaction in Indonesia. This achievement shows that Bank Syariah X has carried out one or even three key components in the development of digital technology; customer experience, the best company operations, and new business models (Ningrum et al., 2023). Customer experience is obtained because of the ease, security, and speed of crisis handling in the operationalization of Bank Syariah X's digital technology, so as to make customers assume the high quality of Bank X's operations (Aditya & Diana, 2023; Pratwi & Dahruji, 2024).

This research uses primary data in the form of interviews with four key informants of the company, namely, staff in the digital banking unit, the region head, the branch manager Bank X, and Bank X customers. The informants agreed to publish the interview results with concealed names and institutions. This research also uses secondary data in the form of a blueprint for digital technology development at Bank X, financial reports that explain Bank X's digital risk mitigation, and other data relevant to the research objectives. In addition, this research also conducted an observation process to determine the operationalization and implementation practices of digital technology at the Bank X office.

The data analysis techniques used in this research were data reduction, data presentation, and conclusion drawing. Data reduction in this study is the simplification, categorization, and concentration of the findings on risk mitigation of digital technology implementation according to the results of the interviews, observations, and secondary data. Data presentation is the process of displaying findings in accordance with research objectives. Drawing conclusions is the process of synthesizing results.

This study used data source triangulation to ensure data validity and reliability. Triangulation was carried out to ensure that the results of the interviews with each informant were consistent, even though the questions were modified. In addition, the interview results were compared with documentation of risk mitigation flyers and employee training observations to ensure digital technology security for customers.

RESULT AND DISCUSSION

Forms of Digital Technology Implementation

Digital transformation increases customer expectations for services that are more efficient, easy, and safe, thus increasing customer images to continue transacting in Islamic banking (Ningrum et al., 2023; Sudarmanto et al., 2024). Islamic banks have implemented several forms of digital technology in their business processes, including digitizing products and services, using artificial intelligence, data analysis, and integrating digital ecosystems (Setianingrum et al., 2025). This form is generally divided into four forms of service, although the name and focus of the developed features are different. The four forms of digital services are account administration, transaction authorization, financial management, and product services in accordance with FSA regulations (Aripin et al., 2022).

Account administration is a form of digital technology that makes it easier for customers to carry out account administration processes such as account opening, closing, checking account mutations, and updating data for all deposits, financing, or other accounts (Aripin et al., 2022). Transaction authorization identifies the validity of transactions for both financial and non-financial activities of customers (Aripin et al., 2022). This transaction, for example, takes the form of filling in a security code or sending a certain code via a short message when a customer makes a transaction. Financial management is a form of digital technology in the form of customer financial planning services for short-term financial planning (Aripin et al., 2022), such as vacation plans, and long-term management, such as insurance and pension funds of financial institutions that are integrated with customer account administration. The last form of digital technology is in addition to the three previous forms but is still in accordance with government regulations.

Sharia Banking X accommodates changes in people's lifestyles through the use of technology by developing digital technology in products that make it easier for customers to use the bank's services. As stated by Mrs. FDA, the regional head of Sharia Banking X.

"*The current generation is truly a digital generation, so it is indeed very necessary, and coincidentally, our bank is currently focusing on enhancing all its digital systems in customer service, whether it be for account opening, features in M-Banking, and features in its ATMs.*" (Ms. FDA, May 24, 2025)

This statement aligns with the response from Mr. RZ, the branch manager of Bank X, who explained that one of Bank X's development roadmaps is the implementation of digital technology: The implementation of digital technology is part of Bank X's long-term plan because of the strong influence of technology as a competitive advantage for the bank.

"*Several years ago, Bank X began focusing on digital banking efficiency, transforming non-digital channels, such as branch offices, ATMs, and human resources, into digital technology.*" (RZ, May 23, 2025)

The focus on digital banking has earned Bank X several awards as the bank with the best service in Indonesia for three years. These awards are also tied to Bank X's strong ambition to leverage technology as a new strength to dominate the Islamic finance industry's market share. Results of an interview with Mr. YT, a digital banking staff member at Bank X.

"*Currently, Bank X's digital marketing channels are also optimizing social media platforms such as YouTube, Instagram, LinkedIn, and X to engage more personally with the public on social media. The next development is encrypted digital technology, such as blockchain technology, optimizing artificial intelligence (AI) across all technologies at Bank X, both internally (employees) and externally (customers and stakeholders), and collaborative digitalization with FinTech. These developments are divided into three periods: short-term (1 year), medium-term (1-3 years), and long-term (>5 years). This roadmap aligns with the company's vision and mission at Bank X to ensure it remains the top choice for Islamic banking in Indonesia.*" (YT, May 24, 2025)

Based on the interview, Bank X's digital products are generally divided into two categories: internal products, which include the company's internal operational systems (used by employees), and external products, which are divided into individual and non-individual customers (business customers). This internal and external division is similar to

previous research, which states that banks and customers use digital banking products differently (Trimulyana, 2024). For internal users, these products streamline operational processes and product offerings to customers, whereas for external users, digital products simplify daily, routine, and important transactions. Bank X's digital technology implementation generally uses a Content Management System (CMS) consisting of two types: basic CMS, which only accommodates user makers and approvers, and advanced CMS, which is equipped with user checkers. The transaction limits of both CMSs can be customized as needed, but the transaction features of advanced CMSs are more complex.

There are five forms of digital technology: robo-advisors to facilitate Islamic investment, blockchain for transparency and security, fintech for inclusive financial services, data analysis for service personalization, and biometric technology for data security (Qothrunnada et al., 2023; Rahmawati et al., 2024). Robo-advisors are a form of digital service that allows customers to automate the management and diversification of the investment process (Qothrunnada et al., 2023). Blockchain can increase transaction transparency because it is presented in real time and increase security because it can be accessed directly by customers to build customer trust (Qothrunnada et al., 2023; Rahmawati et al., 2024). The most commonly used fintech is mobile banking for conducting non-cash transactions. Banks conduct data analysis by analysing customer spending transactions and provide input according to the usual transactions, for example, offering vacation loans for customers who have many hotel transactions, travel, and other entertainment. Transaction authorisation is performed using fingerprints or face scans for digital technology access. This authorization can reduce the potential risk of fraud by irresponsible parties (Qothrunnada et al., 2023).

Bank X uses digital banking for almost all its operational processes. Bank X's core banking system has international certification in collaboration with Oracle, which can be used by users, makers, checkers, and approvers at several levels for all transactions at Bank X. Additionally, there is a derivative of the core banking system, namely the Miniature Circuit Breaker (MCB) report, which is used for operational activities and can only be accessed through the internal office network, the XQRIS dashboard, the Manage Engine Service Desk, X-Direct, and centralized communication via Outlook email. Another digital product Bank X uses is Bank X Human Power, which includes a human resource system application that facilitates recruitment, historical data, self-development, attendance (leave/vacation), reimbursement, and resignation.

Bank X's external parties are divided into two types of customers: institutional (non-individual) and individual customers. The most widely used digital banking channel for institutional customers (non-individuals) is the Xadina channel, a web-based cash management/inter-banking system. Customers can choose to use either hard or soft tokens. If a soft token is used, it is sent to the user's mobile phone. The features in Xadina are diverse, ranging from simple functions like checking balances to transferring funds to other Bank X accounts or accounts outside Bank X using online transfer methods, bi-fast, the national clearing system, and real-time gross settlement. Additionally, there are features for tax payments, contributions to deposit insurance institutions, payroll payments, multi-transfers, and bulk transfers.

The application offered by Bank X is Xdin, a mobile banking app designed as a super app with geometric security features, random PINs, and one device, one access. The app features include balance checks, account transactions, transfers, multichannel payments, online account opening, and ATM card delivery to the customer's address. Xdin also includes funding, financing, and mutual fund portfolios, all accessible within a single app, along with a free chatbot feature. Xdin also includes several Islamic features, such as zakat, qibla direction, prayer times, the Quran, and more. Additionally, there is a self-service option for providing feedback, suggestions, or complaints regarding the app's operations. This app significantly enhances Bank X's efficiency by reducing the number of technical staff and optimizing customer service through more intensive customer support. In addition to Xdin, customers can utilize the pay wave technology embedded in their ATM cards. Pay wave ensures safer transactions (contactless/tap-cash transactions). The results of this study

indicate that comprehensive digital technology has earned Bank X the title of the bank with the best digital banking services in Indonesia.

Mitigation Risk of Digital Technology Implementation

The main elements in the development of digital technology are data, technology, risk management, collaboration, and institutional order (Haq et al., 2024). In addition, the implementation of digital technology requires organizational readiness to transform, which can be in the form of an entity's vision to develop appropriate technology, a technology development process that involves key elements, employee technology capabilities that can be formed through massive and structured training, leadership and organizational structures that support technology development, and a technology culture that must be deeply rooted in the organization (Rahmawati et al., 2024; Shanti et al., 2023). This element requires banks not only need to develop expansive digital technology and pay attention to digital risk management to ensure customer data security.

There are at least 12 risks associated with the use of Islamic banking digital technology, namely phishing in the form of telephone fraud, ransomware attacks carried out by sending certain applications to obtain customer banking data, online fraud, hacking applications and user emails, theft of customer data, illegal content attacks, cyber espionage, data forgery, and cyber terrorism (Azmi et al., 2024). This risk requires banks to mitigate the risk components of the IT framework, namely risk governance, risk evaluation, and risk responses (Fajri & Violita, 2023), or other studies simplify this risk component into only banking risk management (Faizal et al., 2023; Febiantoro et al., 2024; Ngamal & Perajaka, 2022; Raihan et al., 2024).

Another risk management strategy that can be implemented by banks is a digital technology security strategy that can be carried out in the form of multi–layered authentication (Setianingrum et al., 2025) or more than one authentication system, for example, entering a pin to enter the system, and there is a notification in the email, entering a One–Time Password number via text message, and registering a unique number that is different from the pin for transfer transactions, purchases, and bill payments. Data encryption ensures that important customer transactions are stored and backed up within a certain period (Setianingrum et al., 2025). This encryption can provide peace of mind to customers regarding the security of the transaction process. Biometric technology, namely the use of fingerprints, faces, irises, or other physical characteristics, ensures that the opening is the account owner (Setianingrum et al., 2025).

The development of digital technology requires banks to implement risk management at every stage, including caution in decisions regarding the use of vendors in digital technology development and compliance with OJK regulations so that customers feel secure due to their confidence in the bank's compliance with applicable regulations (Aripin et al., 2022). These three requirements necessitate banks to have a dedicated unit for digital banking services. Generally, this unit has at least seven functions: establishing policies and procedures for digital technology; ensuring that development is in line with the bank's strategic plan; monitoring the implementation of cooperation with vendors; monitoring financial transaction data; ensuring the effectiveness and efficiency of digital technology development; continuously monitoring obstacles and challenges in digital technology development; and comprehensively supervising the readiness of resources and infrastructure (Aripin et al., 2022).

The risk mitigation measures implemented by Bank X to avoid cybercrime risks include massive, structured, and continuous socialization. This socialization utilizes all of Bank X's official social media channels. The following are examples of Bank X's socialization through social media. Figure 1 shows a poster showing safe online shopping using the Xdin app (display in Bahasa).



Figure 1. Online Shopping Security Flyer

The figure 1 shows that Bank X provides detailed education on potential cybercrimes through customer purchasing activities. Five methods that customers can use are ensuring the credibility of the website/seller, conducting a thorough check of the product, optimizing gadget security by updating the operating system, paying through a temporary holding account, and not sharing secret codes. This education is widely shared by Bank X's relationship managers and posted on social media to alert customers about transaction security.

The development of digital technology requires banks to implement risk management at every stage and implementation, prudence, including the decision to use vendors in digital technology development, and compliance with FSA regulations so that customers feel safe because of confidence in banking compliance with applicable regulations (Aripin et al., 2022). These three demands oblige banks to have a special section related to digital banking services. In general, this unit has at least seven functions: making general policies and procedures for digital technology, ensuring conformity of development with banking strategic plans, monitoring the implementation of cooperation with vendors, monitoring financial transaction data, ensuring the effectiveness and efficiency of digital technology development, continuous monitoring of obstacles and challenges in digital technology development, and comprehensive supervision of resource and infrastructure readiness (Aripin et al., 2022).

Additionally, Bank X frequently creates flyers about cybercrimes that customers may encounter in the future. These crimes include online fraud, hacking of user applications and emails, theft of customer data, illegal content attacks, cyber espionage, data forgery, and cyberterrorism (Azmi et al., 2024). Figure 2 shows two examples of flyers used to mitigate the risk of cybercrime (display in Bahasa).



Figure 2. Flyer on Avoiding Cyber Crime

In addition to socialization, Bank X requires every relationship manager to approach customers personally by meeting them directly or via WhatsApp. Furthermore, Bank X conducts continuous training and upgrades for all employees, especially the sales force, and performs assessments to ensure their risk mitigation competencies.

Regular updates to the mobile banking app are also carried out for protection or enhanced cyber security. The features used in Xdin also apply a high level of security that can only be accessed on one device per user, with a password and a transaction identification number that is always different for every transaction. Bank X also provides a 24-hour call center for domestic and international customers, which customers can access in emergencies. These mitigation efforts were confirmed by a customer whose account had been hacked. Bank X acted swiftly to provide transaction security guarantees at Bank Syariah X.

"*At midnight, there were several transactions from mobile banking in the form of transfers to overseas accounts that I did not make. In the morning, I was notified that my account had been temporarily frozen and the funds would be returned immediately.*" (MA, May 22, 2025)

CONCLUSION

Technology is rapidly developing. Banks are accommodating technological developments in digital technology that facilitate banking operational processes and provide optimal customer service. However, the convenience of technology also carries the risk of cybercrime, which can harm customers and the reputation of banks. Therefore, this study was conducted at Bank X to provide empirical evidence of implementing risk mitigation measures for using digital technology in banking. This research is important to ensure that technology can be optimally utilized without fearing cybercrime risks. The study results show that Bank X uses digital technology for internal operational activities and to facilitate customer transactions. Bank X customers are divided into individual and institutional customers (non-individuals) who utilize different digital technologies. Bank X uses a comprehensive application for individual customers to facilitate daily transactions, such as bill payments, transfers, and investment activities. Digital technology is used for personalized and secure cash-management activities for institutional customers. Bank X has several ways to mitigate risks, such as massive socialization through social media, a personal approach through relationship management, and continuous internal security upgrades. The integration of social media for cybersecurity education is a novel risk mitigation strategy rarely discussed in previous Islamic banking literature.

LIMITATION AND SUGGESTION

This research was only conducted at Bank X, so some digital technology issues may not be experienced by Bank X. Further research can be conducted on several Islamic banks to obtain comprehensive knowledge about risk mitigation in Islamic banks for optimizing Islamic banking services.

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