APPLICATION OF BLOCKCHAIN TECHNOLOGY IN FINTECH FOR GREEN AND SUSTAINABLE FINANCE IN VIETNAM

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ABSTRACT:
This study explores the application of blockchain technology in the field of financial technology (Fintech), with a focus on its potential to advance green and sustainable finance initiatives. Amid growing global concerns about environmental sustainability, the financial sector faces increasing pressure to implement practices that support eco-friendly investments and efficient resource management. Blockchain, known for its transparency, security, and decentralized nature, offers promising solutions for tracking, verifying, and ensuring the integrity of sustainable financial transactions. The study also examines the broader role of Fintech in promoting the development of green finance. Research findings highlight that security concerns remain a key factor influencing user trust in Fintech platforms. The integration of blockchain into financial operations is found to significantly support the growth of sustainable finance, contributing to the formation of a more resilient and environmentally responsible financial ecosystem.
Keywords: blockchain, fintech, sustainable green finance, Vietnam.

1. Introduction

The application of blockchain technology in fintech is increasingly recognized as a pivotal factor in advancing sustainable green finance. This integration not only enhances financial operations but also promotes environmental sustainability through innovative solutions. Blockchain's decentralized and transparent nature addresses critical challenges in green finance, such as information asymmetry and high transaction costs, thereby fostering trust among stakeholders (Udeh et al., 2024). One of the primary advantages of blockchain in the context of green finance is its ability to enhance transparency and traceability in financial transactions. For instance, blockchain can facilitate the issuance and management of green bonds, ensuring that funds are allocated to environmentally beneficial projects as intended (Udeh et al., 2024). This capability is crucial for building investor confidence and ensuring compliance with sustainability criteria, which are often difficult to monitor in traditional financial systems.

The use of blockchain can significantly reduce operational costs associated with green financing by streamlining processes and minimizing the need for intermediaries (Lahkani et al., 2020). Moreover, fintech innovations, particularly those leveraging blockchain, are instrumental in promoting financial inclusion, which is essential for sustainable economic development. By providing access to financial services for underserved populations, fintech can drive investments in green technologies and sustainable practices. For

example, initiatives that utilize blockchain for micro-lending can empower small businesses to invest in eco-friendly technologies, thereby contributing to a greener economy (Liu et al., 2022). This democratization of finance not only supports individual entrepreneurs but also aligns with broader sustainability goals by fostering a culture of environmental responsibility among businesses.

Currently, there are few studies that explore the security factor in fintech that affects fintech adoption in the green context sustainable green finance in Vietnam. To address the above problem, this study underscores the significance of applying blockchain technology within the Fintech sector to advance Green Finance in Vietnam.

The findings of this research provide valuable insights for managers and Fintech enterprises, enabling them to enhance the quality of technological products. Specifically, the application of blockchain can improve transparency and security, thereby attracting consumers to utilize Fintech solutions for the development of Green Finance.

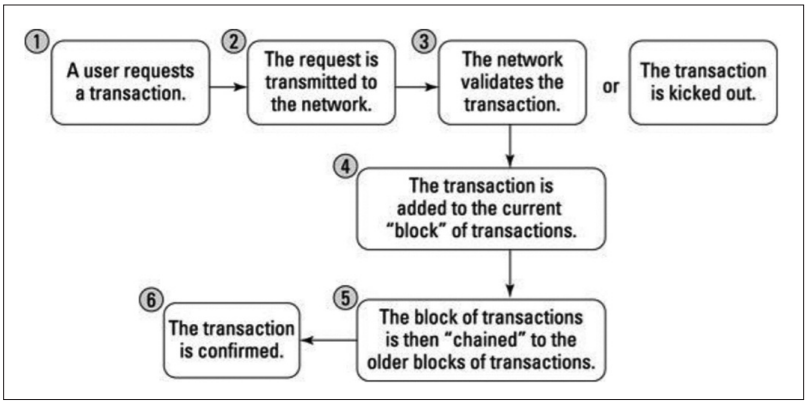
2. Theoretical background

2.1. The concept of Blockchain technology

Blockchain is a decentralized digital ledger technology that enables the secure and transparent recording of transactions across multiple computers. This innovation allows for the creation of immutable records, meaning that once data is recorded, it cannot be altered retroactively without the consensus of the network participants. Blockchain operates through a series of interconnected blocks, each containing a set of transactions and a cryptographic hash of the previous block, thereby forming a continuous chain. The fundamental characteristics of blockchain include decentralization, transparency, and security. Decentralization eliminates the need for a central authority, thereby reducing the risk of fraud and enhancing trust among participants. Transparency allows all authorized users to access and verify the transaction history, fostering accountability. Security is achieved through cryptographic techniques, which protect the integrity of the data and prevent unauthorized access.

Blockchain technology has applications across various sectors, including finance, supply chain management, healthcare, and more, offering innovative solutions for efficiency and trustworthiness in data management. As the technology continues to evolve, its potential to disrupt traditional systems and processes becomes increasingly evident.

Figure 1: The operating principles of a Blockchain network



Source: Laurence, (2017)

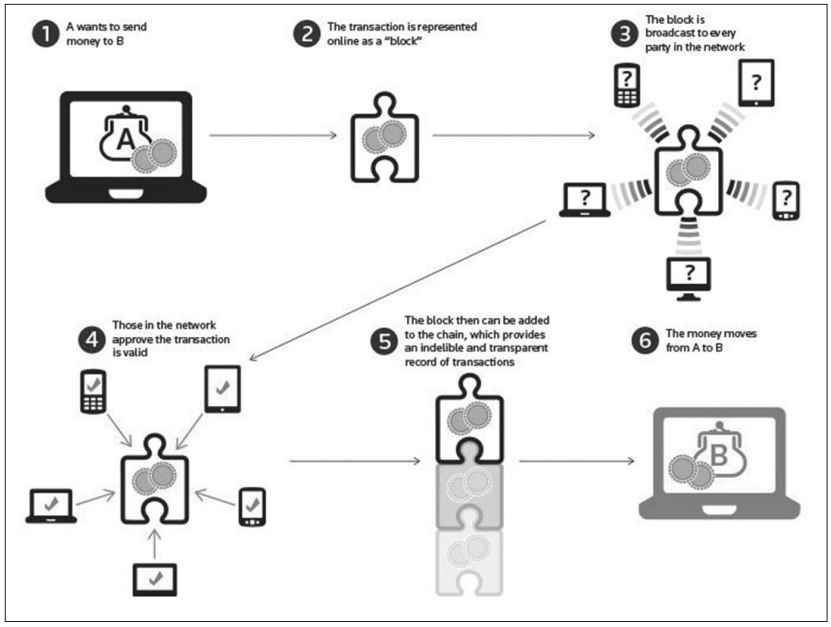
2.2. Application of Blockchain technology in Fintech

Blockchain technology has emerged as a transformative force in various sectors, particularly in finance, where it enhances transparency, security, and efficiency. This decentralized ledger technology allows for the secure and immutable recording of transactions, which is crucial in addressing issues such as fraud and data manipulation in financial systems (Wu et al., 2024). The unique characteristics of blockchain, including its transparency and traceability, enable new business models that can significantly improve the operational frameworks of financial institutions (Wu et al., 2024).

In the context of fintech, blockchain facilitates innovative financial solutions that cater to a diverse range of needs, from microfinancing to supply chain financing. The integration of blockchain with

fintech has led to the development of new financing models that are more inclusive and accessible, particularly for small and micro enterprises that have historically faced barriers in accessing capital (Chen, 2024). By leveraging blockchain, fintech companies can streamline processes, reduce costs, and enhance customer experiences, thereby fostering a more efficient financial ecosystem. Moreover, blockchain's role in supply chain financing is particularly noteworthy. It addresses traditional challenges such as information asymmetry and delays in transaction processing. By providing a transparent and secure platform for transactions, blockchain enhances trust among stakeholders and facilitates smoother financing operations (Kabir et al., 2021); (Song et al., 2023). This is increasingly important in today's globalized economy, where the speed and reliability of financial transactions can significantly impact business operations (Wu et al., 2024); (Renduchintala et al., 2022).

Figure 2: Financial transactions utilizing blockchain technology



Source: Michael Crosby et al., (2015)

2.3. An overview of Fintech in Vietnam and countries worldwide

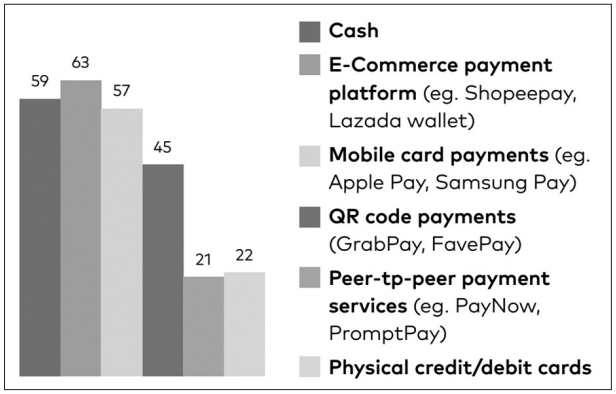
The fintech landscape in Vietnam has evolved significantly in recent years, reflecting broader global trends while also exhibiting unique characteristics shaped by local conditions. The growth of fintech in Vietnam is driven by a combination of factors, including government support, increasing internet penetration, and a youthful population eager to adopt new technologies (Nathan et al., 2022). However, challenges remain, particularly in terms of regulatory frameworks and financial literacy among users.

In Vietnam, studies have shown that the development of fintech has positively influenced the performance of traditional banks by enhancing service delivery and customer engagement (Pham et al., 2024). This trend is mirrored in other regions, where fintech has not only complemented but also transformed traditional banking practices, leading to improved efficiency and customer satisfaction. Cash, E-Commerce platforms (Shopeepay, Lazada wallet), mobile card payments (Apple Pay, Samsung Pay), QR code payments (GrabPay, FavePay), peer-to-peer payment services (PayNow, PromptPay), and physical credit/debit cards are the most commonly used payment methods in Vietnam in 2023 (Figure 3).

Vietnam's population is estimated by the World Bank to be 44% unbanked in 2022, while a considerably larger portion is still underbanked. The credit card ownership rate in Vietnam is about 6%. As to the State Bank of Vietnam, the count of Fintech enterprises in the nation has increased fourfold in the past few years, rising from 39 at the close of 2015 to over 150 companies by 2021. More than 200 Fintech companies were active in several industry areas in 2022, according to a recent UOB survey (Figure 4).

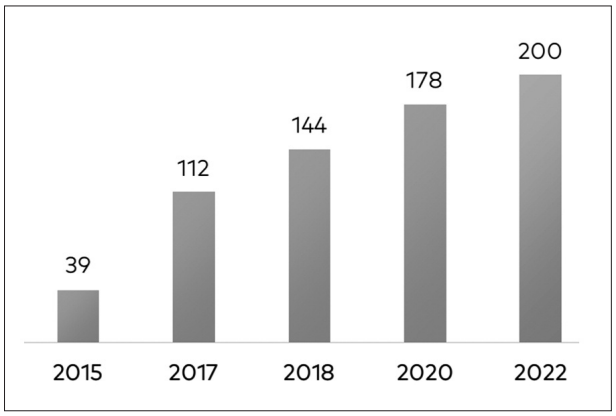
In comparison to Vietnam, other countries have made significant strides in fintech adoption. For instance, in India, fintech has transformed the financial landscape by enhancing access to

Figure 3: Popular payments methods in Vietnam in 2023



Source: UOB

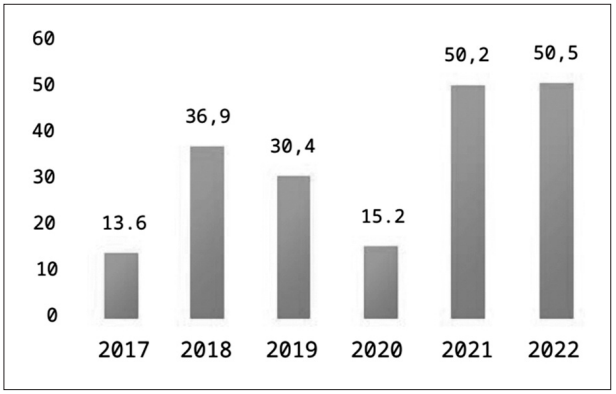
Figure 4: The number of fintech firms in Vietnam from 2015 to 2022



Source: UOB

financial services for the unbanked population through mobile banking and digital payment platforms. Similarly, in African nations, fintech innovations such as mobile money have played a pivotal role in increasing financial inclusion, particularly in rural areas where traditional banking services are scarce (Girma & Huseynov, 2023). These examples illustrate how fintech can effectively address local financial challenges and promote economic empowerment. Moreover, the impact of fintech on bank performance is notable. The Asia-Pacific region's total investment in fintech grew at an average annual rate of 60% during the previous five years, from US$13.6 billion in 2017 to US$50.5 billion in 2022, according to Statista statistics (Figure 5).

Figure 5: Fintech investment in APAC (US$ billion), 2017 – 2022



Source: Statista

2.4. The role of Fintech in the sustainable development of green finance in Vietnam

Alongside the growth of other industries, the Fintech market has seen a new wave of environmentally sustainable goods emerge in recent years. These products are known as "Green Fintech." Technology advancements used in financial services and solutions that specifically promote sustainable development objectives are referred to as green fintech. This covers programs like green lending, green digital asset solutions, crowdfunding, green digital payments, green digital investment solutions, green digital analytics, and green regulatory technology. Figure 6 shows the top 15 countries in Green Finance in 2023 (Table 1).

The role of fintech in promoting sustainable development and green finance in Vietnam is increasingly significant, as the country seeks to enhance financial inclusion and address environmental challenges. Fintech, characterized by its innovative use of technology to deliver financial services, has the potential to transform traditional financial systems and facilitate access to green financing for various stakeholders, including small and medium enterprises and individual consumers.

The key components of sustainability and green practices in Fintech include technological solutions, environmental impact, ethical investment, financial services, transparency and accountability. In Vietnam, fintech is emerging as a crucial driver of

Table 1. Some leading countries in the field of Green Finance in 2023

GGFI 11 Rank	Centre	GGFI Dimensions			
		Depth Rating Rank	Depth Rating	Green Finance Rank	Quality Rating
1	London	2	316	1	326
2	New York	1	319	2	322
3	Stockholm	3	314	6	307
4	Geneva	8	307	3	313
5	Luxembourg	4	312	14	304
6	Amsterdam	12	305	4	310
7	Los Angeles	8	307	6	307
8	Copenhagen	14	304	5	309
9	Washington DC	8	307	10	305
10	San Francisco	6	308	17	303
11	Singapore	5	309	20	301
12	Zurich	15	303	8	306
13	Sydney	12	305	17	303
14	Edinburgh	17	302	10	305
15	Seoul	6	308	23	308

Source: Global Green Finance Index 11

financial inclusion, particularly in the context of green finance. The integration of fintech solutions, such as mobile payments and crowdfunding platforms, allows for easier access to capital for environmentally sustainable projects. This is particularly important for SMEs, which often struggle to secure funding through traditional banking channels. By leveraging fintech, these businesses can obtain financing more efficiently, thus promoting green initiatives that align with sustainable development goals.

2.5. Development trends in Fintech in Vietnam: Opportunities and challenges

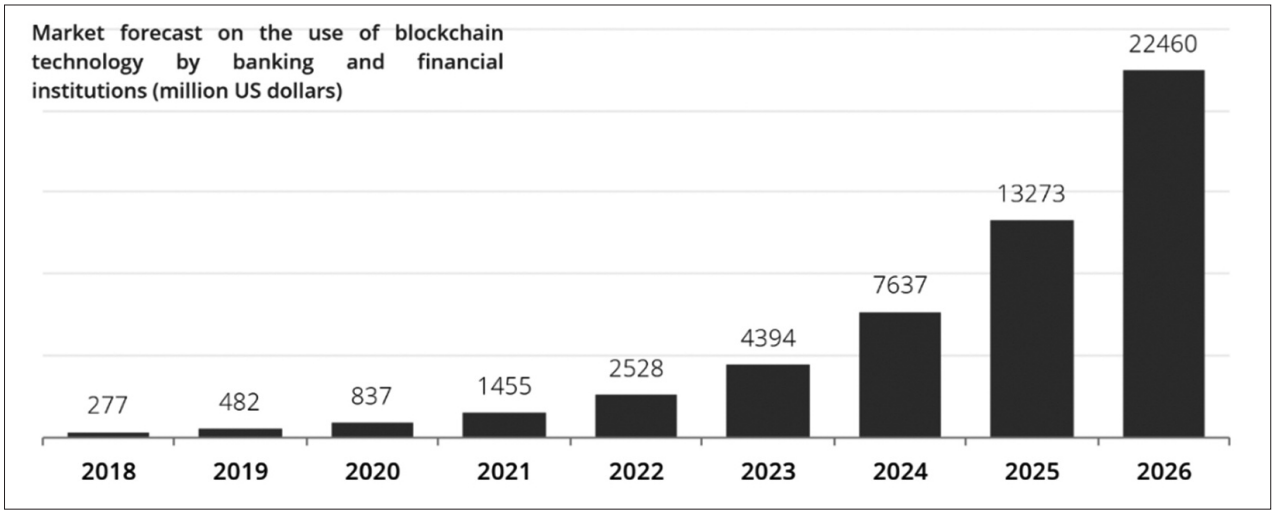
The development trends in fintech in Vietnam present a landscape rich with opportunities and challenges, reflecting both local dynamics and global influences. As the fintech sector continues to evolve, it plays a crucial role in enhancing financial inclusion, improving service delivery, and driving innovation within the financial services industry. One of the primary opportunities presented by fintech in Vietnam is its potential to enhance financial inclusion, particularly among underserved populations. The COVID-19 pandemic has accelerated the adoption of digital financial services, as many individuals and businesses sought contactless solutions during lockdowns (Nathan et al., 2022) . Fintech platforms, such as mobile wallets and peer-to-peer lending services, have emerged as vital tools for providing financial access to those who previously relied on informal financial systems. This shift is particularly significant in a country where a substantial portion of the population remains unbanked or underbanked, highlighting fintech's role in bridging the financial gap (Nathan et al., 2022).

While Vietnam's fintech sector is still maturing, it holds significant potential for driving financial inclusion and economic growth. The interplay between government support, user engagement, and technological innovation will be critical in shaping the future of fintech in Vietnam. As the

country continues to navigate its unique challenges and opportunities, lessons from other nations can provide valuable insights into fostering a robust fintech ecosystem (Figure 6).

Scholar, Science Direct, and Springer. Secondary data was collected from organizations such as the World Bank, Precedence Research, and Statista. The search criteria included keywords relevant to

Figure 6: Forecast on Blockchain application in finance and banking industry to 2026



Source: Allied Market Research. Blockchain in BFSI Market Statistics, 2019

Vietnam's middle class, comprising approximately 77.9 million individuals as of January 2023, is characterized by a high degree of technological literacy. The increasing adoption of digital technologies within this demographic presents substantial opportunities for consumer finance companies to collaborate with the Fintech sector. Moreover, cybersecurity and data protection offer further prospects for Vietnam's Fintech industry. A recent analysis by the cybersecurity firm Kaspersky indicates that Vietnam is the least vulnerable nation in Southeast Asia to financial cyberattacks targeting banks, payment processors, and online merchants. Specifically, Vietnam experienced only 26.36% of the region's total cyberattacks related to banking and payment systems, the lowest proportion compared to other countries in the region, such as Indonesia (40.87%), the Philippines (64.03%), and Singapore (51.6%) (Allied Market Research).

3. Research methodology

The first step involves identifying the research objectives, followed by a literature review and user survey. The literature was sourced from prestigious global journals through platforms such as Google

the research topic. To assess users' overall perceptions of Fintech in Vietnam, the author designed a questionnaire for the survey. This questionnaire was distributed via the personal email accounts of individuals who utilize Fintech for financial transactions. After receiving the completed surveys and cleaning the data, a total of 322 valid responses were included in the statistical analysis.

4. Research results

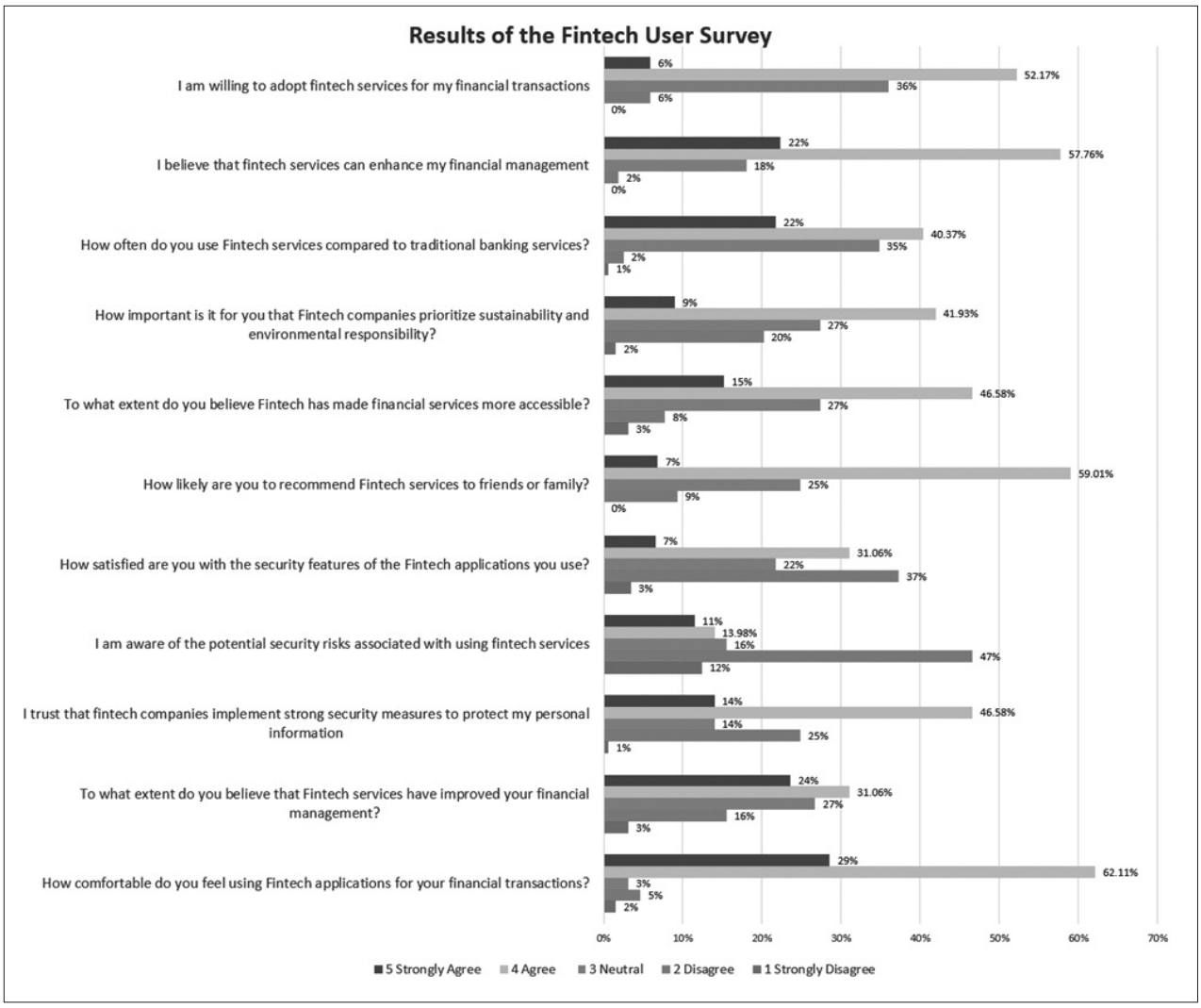
Following the survey of user perceptions regarding Fintech, the author compiled and evaluated the results. This analysis serves as a foundation for providing recommendations to Fintech enterprises in Vietnam. (Figure 7).

5. Discussion

Overall, respondents expressed a positive perception of Fintech and acknowledged the benefits it offers users. In the survey questions, the proportion of individuals agreeing with the statements was relatively high, whereas those selecting "strongly agree" or "strongly disagree" typically represented a smaller percentage.

Analysis of several key questions reveals that for the item "How comfortable do you feel using

Figure 7: Results of a consumer survey on Fintech



Source: Author's data analysis

Fintech applications for your financial transactions?", 62% of respondents indicated agreement, suggesting that the majority of users are satisfied with Fintech services, which is a notable finding. Conversely, in response to the question "I am aware of the potential security risks associated with using Fintech services," a significant 47% of users expressed dissatisfaction regarding security issues. This indicates that users harbor concerns about the security of Fintech applications. Regarding the question "How important is it for you that Fintech companies prioritize sustainability and environmental responsibility?", consumers rated the environmental responsibility of Fintech companies positively, with 42% expressing satisfaction. However, a noteworthy percentage of users (20%) remained dissatisfied with the commitment of Fintech companies to sustainable development, particularly in the context of Green Fintech. These survey results suggest that Fintech companies should enhance product quality, particularly concerning security measures, to increase user confidence, especially in the implementation of blockchain technology in financial transactions.

6. Conclusion and suggestion

Based on the insights gathered from the survey, it is evident that users generally have a favorable

perception of Fintech and recognize its benefits. While a significant majority express satisfaction with Fintech applications, concerns regarding security remain prominent, with nearly half of the respondents highlighting dissatisfaction in this area. Furthermore, while many users appreciate the environmental responsibility of Fintech companies, a notable percentage still feels that these companies could enhance their commitment to sustainable practices, particularly in the realm of Green Fintech. To foster greater user confidence and satisfaction, it is imperative for Fintech companies to prioritize improvements in security measures and to actively demonstrate their commitment to sustainability. By addressing these key areas, Fintech organizations can not only enhance user experience but also strengthen their position in a competitive market focused on both innovation and environmental responsibility. Overall, the findings underscore the importance of continual improvement and responsiveness to user concerns in the evolving landscape of Fintech. Based on the research findings, the authors present the following recommendations to promote the growth and sustainability of the Fintech industry in Vietnam, we propose the following recommendations:

First, the government should continue to refine and clarify regulations governing Fintech activities. Establishing a supportive regulatory environment will encourage innovation while protecting consumers and financial stability.

Second, strengthen cybersecurity measures. Fintech companies must prioritize strong cybersecurity protocols to protect sensitive customer data. Implementing advanced security technologies and conducting regular audits can help build user trust and reduce risks.

Third, promote financial literacy. Initiatives to improve mainstream financial literacy among the population are essential. Collaboration between Fintech companies, educational institutions, and government agencies can facilitate better understanding of financial products and services, especially in underserved communities.

Fourth, streamline the banking communications system. The relationship between Fintech companies and financial communications institutions can be mutually beneficial. By leveraging each other's strengths, these synergies can enhance service delivery and expand market reach.

Fifth, support green Fintech architects: Encouraging the development of sustainable financial products and services could position Vietnam as a leader in green Fintech ■

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ỨNG DỤNG CÔNG NGHỆ BLOCKCHAIN TRONG VIỆC PHÁT TRIỂN TÀI CHÍNH XANH VÀ BỀN VỮNG TẠI VIỆT NAM

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TÓM TẮT:

Nghiên cứu này đánh giá việc ứng dụng công nghệ chuỗi khối (blockchain) trong lĩnh vực công nghệ tài chính (Fintech), với trọng tâm là tiềm năng của công nghệ này trong việc thúc đẩy các sáng kiến tài chính xanh bền vững. Trước những lo ngại ngày càng gia tăng trên toàn cầu về vấn đề bền vững môi trường, ngành tài chính đang chịu áp lực lớn trong việc triển khai các thực hành hỗ trợ đầu tư thân thiện với môi trường và quản lý tài nguyên hiệu quả. Blockchain, với các đặc tính nổi bật về tính minh bạch, bảo mật và phi tập trung, mang đến các giải pháp đầy hứa hẹn trong việc theo dõi, xác minh và đảm bảo tính toàn vẹn của các giao dịch tài chính bền vững. Bên cạnh đó, nghiên cứu cũng xem xét vai trò tổng thể của Fintech trong việc thúc đẩy sự phát triển của tài chính xanh. Kết quả nghiên cứu chỉ ra rằng các mối lo ngại về bảo mật là yếu tố ảnh hưởng đáng kể đến niềm tin của người dùng đối với các nền tảng Fintech. Việc tích hợp công nghệ chuỗi khối vào hoạt động tài chính có thể góp phần quan trọng trong việc thúc đẩy sự phát triển của tài chính bền vững, từ đó xây dựng một hệ sinh thái tài chính linh hoạt hơn và có trách nhiệm hơn với môi trường.

Từ khoá: blockchain, công nghệ tài chính, tài chính xanh bền vững, Việt Nam.