Asia Pacific Academy of Science Pte. Ltd.

Metaverse 2024, 5(1), 2415
https://doi.org/10.54517/m.v5i1.2415

Article

Blockchain-based cyber-security proposal in commerce mobile platforms for social and sustainability businesses

Basheer Riskhan, SaifAlmajd Mohammed Hassan Almassri, Khalid Hussain*, Halawati Binti Abd Jalil Safuan

School of Computing and Informatics, Albukhary International University, Alor Setar 05200, Malaysia
*** Corresponding author**: Khalid Hussain, Khalid.hussain@aiu.edu.my

CITATION

Riskhan B, Almassri SMH, Hussain K, Safuan HBAJ. Blockchain-based cyber-security proposal in commerce mobile platforms for social and sustainability businesses. Metaverse. 2024; 5(1): 2415. https://doi.org/10.54517/m.v5i1.2415

ARTICLE INFO

Received: 16 October 2023
Accepted: 21 January 2024
Available online: 19 February 2024

Abstract: This study aims to propose the integration of cyber security measures with sustainable mobile commerce platforms and evaluate their efficacy in promoting social entrepreneurship and sustainability in the field of mobile commerce. A platform was developed for Android and iOS platforms using the Flutter Framework and Dart Programming Language, and it included features designed to help social entrepreneurs and non-profit organizations connect with potential donors, volunteers, and partners. The study includes participants from social entrepreneurs, non-profit organizations, and potential donors who are recruited to use the platform to create and promote their social business projects and to provide feedback on their experience using the platform. The results of the integration are expected to show that the mobile platform for social business is effective in promoting social entrepreneurship and sustainable development and in connecting social entrepreneurs and non-profit organizations with potential donors and partners due to the security measures that have been taken in the application and data protection, ensuring privacy with a comparatively lower risk than other platforms. In conclusion, this paper presents a blockchain-based secure mechanism for mobile platforms for m-commerce and social business, which is a valuable tool for promoting social entrepreneurship and sustainable development. It can be used to create a positive social impact in local and, conceivably, international communities. The proposal explicitly explains the methodology and implementation of the platform and highlights the significance and impact of this research in advancing the fields of mobile commerce, social entrepreneurship, and sustainability.

Keywords: blockchain; mobile commerce; sustainable secure development

1. Introduction

This research aims to propose a secure mobile platform for e-commerce with a particular focus on social business and sustainability within the region of Malaysia. The rise of mobile devices has enabled businesses to reach potential customers anytime, anywhere, while opening up new marketing channels. Unfortunately, mobile platforms are also vulnerable to cyberattacks, introducing a need for a secure online marketplace platform that can protect user data and build trust. This study investigates the effectiveness of providing a secure, sustainable m-commerce platform to consumers.

To start with, mobile platforms have become increasingly popular in recent years due to the rise of smartphones and tablets. While these platforms offer numerous benefits, including convenience and flexibility, they also present security risks. According to Çınar and Kara [1], 9,599,519 malware, adware, and riskware attacks on mobile devices were blocked in the third quarter of 2021.

In addition to security concerns, mobile platforms have also changed the way businesses operate by enabling mobile commerce, providing new marketing channels, and increasing workforce mobility. Businesses can reach customers and employees anytime and anywhere, allowing them to provide personalized experiences, streamline processes, and increase productivity, which has provided consumers with the convenience of shopping from anywhere, anytime [2].

There is a lack of sustainable m-commerce platforms due to the complexity of integrating sustainability into e-commerce. Therefore, it is expected that the contribution of integrating blockchain technology into e-commerce can significantly advance sustainability efforts by enhancing transparency, supply chain traceability, and ethical practices. Through blockchain's immutable ledger, consumers gain visibility into product origins and ethical standards, promoting responsible purchasing choices. This technology also streamlines fair compensation, minimizes carbon footprints, and reduces waste in supply chains, fostering environmentally conscious practices. Decentralized marketplaces empower smaller, sustainable businesses and support a circular economy, while energy-efficient blockchain networks reduce their own environmental impact. Trust and verification features ensure consumer confidence in sustainability claims, reinforcing the role of blockchain in building a more sustainable e-commerce ecosystem.

Sustainable e-commerce platforms must consider the entire lifecycle of a product, from sourcing and production to transportation and disposal. This requires collaboration across multiple stakeholders, including suppliers, manufacturers, logistics providers, and customers. It also requires investment in sustainable technologies and infrastructure, such as renewable energy, sustainable packaging, and efficient transportation systems [3].

But in collaboration with Albukhary Mobile, platforms have become an increasingly important component, particularly in the realm of e-commerce. Therefore, this study explores the intersection of mobile platforms, security, and sustainability through the development of a platform that integrates the known security measures into a secure, sustainable marketplace.

2. Literature review

Numerous research studies have explored the security and privacy aspects of e-commerce applications, while others have focused on evaluating their effectiveness. Additionally, some investigations have examined the role of e-commerce in the context of social enterprises and sustainable businesses.

2.1. Overview of research in the area of sustainability and cyber security

E-commerce calls for cyber-security and sustainability: How European citizens look for a trusted online environment [4].

The paper titled "*E-Commerce Calls for Cyber-Security and Sustainability: How European Citizens Look for a Trusted Online Environment*", examines the perceptions of European citizens towards cyber-security and sustainability in the context of e-commerce.

The paper analyzes data from a survey of 7000 European citizens, exploring

their attitudes toward the risks of online shopping, their trust in online vendors, and their expectations for sustainable practicesine-commerce. The results show that European citizens are concerned about the security of their personal data and payment information when shopping online, and they also value sustainable practices in e-commerce.

The paper concludes by highlighting the need for businesses to prioritize cyber security and sustainability in order to build trust with their customers and succeed in the competitive e-commerce market.

2.2. Overview of research in the area of blockchain and sustainability

A paper titled "*Blockchain for Sustainable Development: A Systematic Literature Review*" by Joshi et al. [5] includes a comprehensive review paper that examines the existing literature on blockchain and sustainable development. The paper identifies various areas where blockchain technology can be applied to contribute to sustainable development but lacks e-commerce and online application inclusion.

The paper discusses the challenges associated with implementing blockchain solutions, such as scalability, interoperability, and governance. The authors highlight several successful case studies of blockchain for sustainable development, such as the development of a blockchain-based platform to incentivize recycling. However, the paper does not highlight e-commerce technology integration with blockchain and lacks mention of the online marketplace's existence.

In the same context, another paper titled "*Applications of Blockchain Technology in Sustainable Manufacturing and Supply Chain Management*" by Khanfar et al. [6] provides an overview of the current state of research on blockchain and sustainability, as well as the challenges and opportunities in this field. Although the paper mentions various areas such as renewable energy, supply chain management, and sustainable agriculture, they did not explicitly address the use of blockchain in e-commerce for sustainability purposes.

2.3. Overview of research in the area of mobile commerce

Individuals tend to browse 4.2 times as many products during a single session within mobile apps compared to websites. Furthermore, a study of 143 participants measured the adoption of shopping online via both websites and mobile shopping. The results show that mobile apps are more adopted in terms of accessibility [7,8].

Moreover, global mobile data usage per month has been steadily increasing over the years. With the proliferation of smartphones, widespread internet access, and the development of faster mobile networks, people are consuming more data on their mobile devices than ever before.

As a result of this increase, global mobile data usage per month continues to drive increasing demand for data-intensive applications such as BetterBuy and more (**Figure 1**). The ongoing development of mobile technologies and the expansion of internet connectivity worldwide are expected to further fuel the growth of mobile data usage in the future.

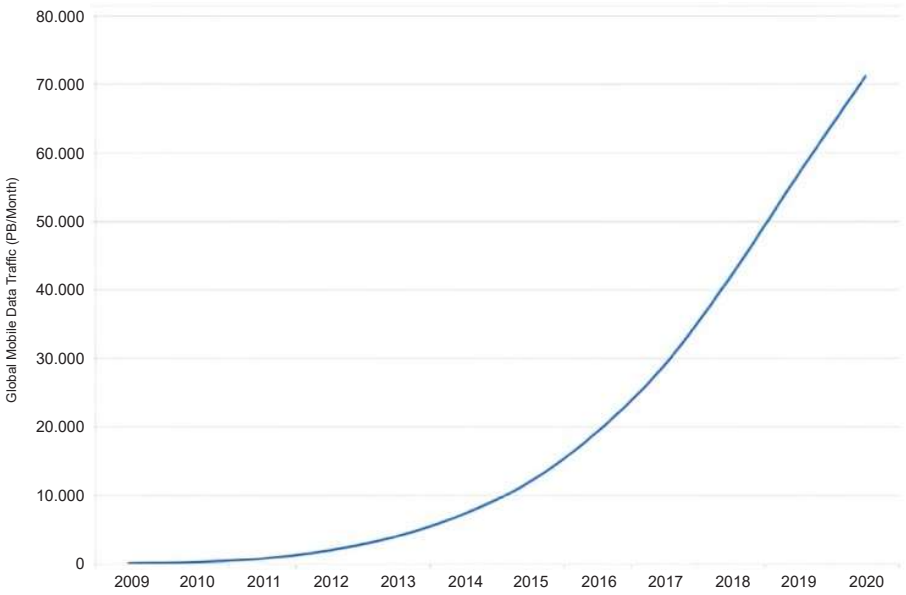

Figure 1. Global mobile data usage (per month) [9].

2.4. Overview of research in the area of security and mobile commerce

A study on the state of m-commerce applications in India was conducted by Kumar et al. [10]. The study found that customers in India are reluctant to adopt m-commerce applications for several reasons. One of the primary causes is that these m-commerce platforms have security and payment issues. Consumers feel that identity theft, phishing, and hacking threats are a constant concern for them and that they cannot trust all mobile commerce applications with their credit cards or personal information. Additionally, they are hesitant to utilize these apps since they require them to use unreliable third-party websites to process payments.

In another empirical work, Taherdoost and Madanchian [11] validated the e-service satisfaction model in the context of m-commerce and found that trust, security, performance, and usability are core elements for achieving customer satisfaction.

Nikkhah et al. [12] identified various factors that affect the privacy and security of mobile applications, which lead consumers to install and use these applications. Their study results indicate that consumers who perceive more security have greater trust and reduced risks. Ghayoumi [13] relates six factors of m-commerce security that are also related to m-commerce, including integrity, non-repudiation, authentication, confidentiality, privacy, and availability. According to their study, these factors play an important role in achieving security in m-commerce applications.

3. Limitations in the area (research gap/motivation)

(1). In the field of sustainability and cyber security, it has been concluded from the paper titled "*E-Commerce Calls for Cyber-Security and Sustainability: How European Citizens Look for a Trusted Online Environment*" that there is clearly a need for a sustainable secure marketplace for online commerce [14] (**Table 1**).

(2). In blockchain and sustainability, although the blockchain technology papers I mentioned do touch upon blockchain and sustainability and how to integrate them for objectives like supply chain management, they may not explicitly address e-commerce in the context of blockchain and sustainability. Further research is needed to explore the specific applications of blockchain in e-commerce and the potential benefits for sustainability [15] (**Table 1**).

(3). Mobile commerce has come to be effective, particularly in providing a streamlined and convenient shopping experience for users. They can offer features such as mobile payments, one-click ordering, and real-time inventory tracking, making it easier for users to browse, purchase, and track their orders [16] (**Table 1**).

(4). With regard to security and mobile commerce, it has been concluded that there is a need for cyber-security and sustainability for people to feel secure when shopping online, especially since technology adoption heavily relies on users' trust and perception. There is a gap in the existing sustainable m-commerce platforms, and there has not been any involvement or consideration of sustainability in the existing online marketplace platforms. After examining the available literature, it can be concluded that security is a major factor that influences how people make their choices on e-commerce platforms, but the previous studies never took the development of an actual platform into consideration and have not included or involved sustainability of a social marketplace instead focused on intersection security and demand [17] (**Table 1**).

Table 1. Key differences: Literature vs. proposed work.

Area of study	Proposed work	Current literature review
Sustainability and cyber security	Proposes a need for a sustainable secure marketplace for online commerce [14].	Current literature discusses European citizens' perceptions on cyber-security and sustainability in e-commerce but does not explicitly address the development of a secure marketplace [14].
Blockchain and sustainability	Proposes the need for further research on the specific applications of blockchain in e-commerce and its potential benefits for sustainability [15].	Existing literature explores blockchain and sustainability but lacks the inclusion of e-commerce. It discusses challenges and successful case studies but does not mention e-commerce [15].
Mobile commerce	Highlights the effectiveness of mobile commerce in providing a streamlined and convenient shopping experience [16].	Current literature discusses the adoption and usage of mobile commerce but doesn't emphasize the specific features that enhance user experience [16].
Security and mobile commerce	Identifies the need for cyber-security and sustainability for online marketplace platforms and the gap in sustainable m-commerce platforms. It emphasizes user trust and security concerns [17].	Current literature addresses security and trust in mobile commerce but lacks consideration of sustainability in online marketplace platforms [17].

4. Context and objectives

4.1. Problem statement

Despite the potential benefits of mobile applications for business practices, there is a lack of security and trust, specifically in sustainable and social business platforms. Therefore, there is a need to deploy security countermeasures for a sustainable m-commerce platform and develop strategies to mitigate risks that would unlock the full potential of mobile technology in promoting online commerce and sustainable business practices.

4.2. Research questions

- How effective is a sustainable mobile platform in providing a marketplace that preserves confidentiality, integrity, and availability?
- How will blockchain be a suitable solution for e-commerce and data protection?
- What could the integration of cybersecurity and sustainability do to significantly change the marketplace?

The fundamental goal is to formulate and create a platform that places utmost importance on safeguarding confidential information, upholding high levels of integrity, and ensuring availability for sustainable and social businesses. It is crucial that the platform is meticulously designed to bring sustainable products and services to raise the impact on society while simultaneously maintaining the rights of clients, vendors, and advertisers through confidentiality, integrity, and availability.

4.3. Hypothesis

- The integration of m-commerce into social business has the potential to significantly enhance the reach, visibility, and impact of sustainable and social businesses.
- Effective marketplace sustainability practices require a secure environment that can support cybersecurity and mobility.
- M-commerce is maintained by minimizing risks and taking measures of security such as confidentiality, integrity, and availability associated with their use in business.

4.4. Research objectives

The goals of this project are multifaceted and include:

- Showing whether a sustainable mobile platform is effective in providing a marketplace that preserves confidentiality, integrity, and availability;
- Demonstrate how blockchain was used as a solution for cyber security in e-commerce;
- Show the significance of combining sustainability with cyber security.

The project seeks to establish a secure and sustainable mobile commerce platform that enables social businesses to thrive while protecting their customers' data and privacy. The research goals include demonstrating the effectiveness of m-commerce applications in protecting customer data and building trust among

users. The study will evaluate the security efficiency of social businesses using m-commerce, analyze the impact on sales and marketing of social business products and services, and create a social business marketplace that prioritizes user rights and security. The study also aims to contribute to the research on the field of m-commerce for sustainable development and provide insights into the potential of m-commerce to promote sustainable business practices and improve user experiences.

By achieving these goals, the research will offer valuable insights into the potential of m-commerce to contribute to sustainable development and enhance user trust and security in social businesses.

5. Methodology

The proposed online marketplace will be designed using a combination of social business principles, cybersecurity best practices, and mobile application development techniques. The system will be designed with a focus on security and privacy and will implement encryption mechanisms for data at rest and in transit. The application will be developed using the flutter framework, which allows for cross-platform compatibility and faster development. The system will be tested using automated testing tools and manual testing methods, including penetration testing and vulnerability scanning.

5.1. Platform introduction

The platform named BetterBuy is an online marketplace that connects consumers with businesses. And focuses on promoting products and services that have a positive impact on society and the environment while maintaining confidentiality, integrity, and availability.

The platform provides a secure user-friendly interface that allows consumers to browse and purchase goods and services from a variety of businesses. Each business listed on the platform is carefully vetted to meet specific social and environmental criteria. This includes factors such as fairtrade, sustainable production methods, ethical labor practices, and the other seven principles Mohammed Yunus mentioned about social business [18,19].

One key feature of the platform is the ability for businesses to share their social impact stories with consumers. This allows consumers to make more informed purchasing decisions and supports businesses that align with their values.

Moreover, BetterBuy features a data-protection microfinance that helps promote financial inclusion and economic development by providing a secure and safeguarded entry to credit and other financial services to those who would otherwise be excluded from the formal financial sector. Typically, it provides loans to self-employed individuals who run small businesses and do not have the collateral or credit history required to obtain loans from traditional banks. These loans are often used to start or expand a small business.

The platform also provides tools for businesses to track their social impact and improve their practices overtime. This includes metrics such as carbon emissions, wealth equality rate, and employee well-being.

Finally, BetterBuy is a protected, trustworthy tool for promoting sustainable

and socially responsible consumption in a modern way. It connects consumers with businesses that are working towards a better future for people and the planet and encourages more conscious consumer impactful behavior.

5.2. Platform objectives

The objective of this project is to design and develop a secure mobile platform for a social business online marketplace. The specific objectives are:

- to implement the first-ever m-commerce social business platform in Malaysia;
- to review and analyze the techniques for secure mobile application development and online marketplace designl;
- to design and implement an online marketplace using Dart Programming Language, and Flutter Framework for mobile in both Android and IOS;
- to implement secure authentication and authorization mechanisms for customers and sellers;
- to integrate blockchain, cloud security, and in-app encryption and decryption algorithms;
- to integrate secure payment gateways, such as PayPal and Stripe, to ensure secure financial transactions;
- conduct a security analysis of the online marketplace, including vulnerability scanning, penetration testing, and threat modeling;
- to demonstrate the effectiveness of the developed application in protecting customer data and building trust;
- to have a premium experience in allowing people to shop for a wide range of products from the comfort of their own homes.

5.3. Development methodology

BetterBuy will use Agile methodology for developing the platform for the several advantages that it offers. Agile is designed to be flexible and adaptable, enabling the company to respond quickly to changing circumstances and customer needs. It also emphasizes collaboration and communication, ensuring that all team members and stakeholders are aligned on the app's goals and features. **Figure 2** shows the Agile software development process.

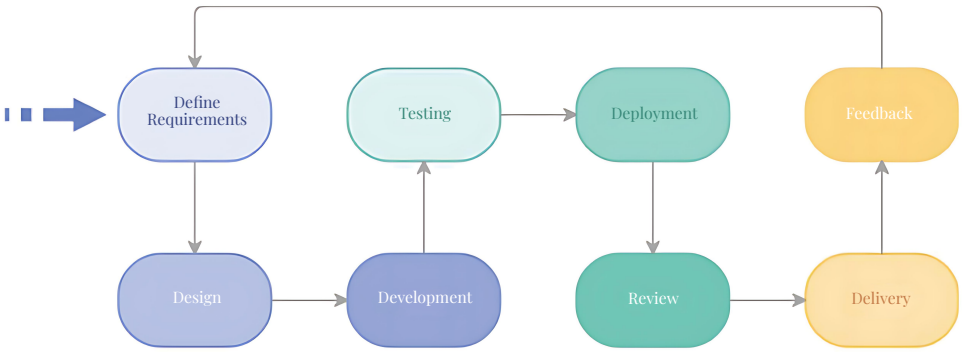

Figure 2. Agile software development process [20].

Additionally, one of the most important reasons to use Agile methodology is that it promotes continuous improvement, allowing the company to continuously

refine and enhance the app's functionality and user experience. These benefits make Agile an excellent approach for developing an app in commerce that meets the needs of users.

According to Lai [21], In order to reduce software requirements change risk, the paper suggests Agile Development Maintainability Enhancement (ADME). thus consolidation of using the ADME procedure exists.

6. Platform segmentation and implementation

BetterBuy is expected to become a well-known online marketplace that offers a wide range of products to its customers, and what sets BetterBuy apart from its competitors are its various factors and features that make it a top choice for online shoppers.

6.1. Social business

The idea behind a social business m-commerce platform is to leverage the power of technology and online connectivity to create a community of socially conscious individuals who are passionate about making a difference. By providing a platform for businesses to sell products that are designed to address social issues or support socially responsible causes, these platforms enable consumers to make a positive impact on their purchasing decisions.

Social business m-commerce platforms typically include features such as social sharing, customer engagement, and storytelling to build a community of like-minded individuals who share a passion for social impact [22]. Users can connect with each other, share their experiences and ideas, and contribute to social causes by making purchases on the platform.

One of the key benefits of a social business m-commerce platform is the ability to build a brand and reputation as a socially responsible and ethical business. By aligning with a social cause, businesses can differentiate themselves from competitors and attract a loyal customer base that values social impact. This can be particularly important for smaller businesses or startups that may not have the resources to invest in traditional marketing and advertising [22].

6.2. Ecosystem development

BetterBuy is starting as a mobile platform because it serve better than web platforms in several ways. Mobile platforms offer a more immersive and interactive user experience compared to web platforms. This is because mobile apps can take advantage of the device's hardware and software capabilities to create a more engaging experience [23].

In addition to this, mobile apps are designed to load quickly and efficiently, which is especially important for users who maybe on slow or unreliable internet connections. In contrast, web apps can be slower to load, especially if they rely on large images or complex scripts. Another advantage of mobile apps is their offline functionality. They can work offline, which means that users can still access certain features and content even when they don't have an internet connection. This is not possible with web applications, which require an internet connection to function. Mobile apps can also send push notifications to users,

which is a powerful way to engage with them and keep them coming back to the app. Web apps can also send notifications, but they are typically less effective because they require the user to be actively using the browser. Lastly, mobile apps can be used daily at anytime and anywhere for purchasing and shopping purposes,which is not always possible with website platforms [23].

6.3. Cyber security considerations

BetterBuy provides several security measures to ensure a safe and secure shopping experience for our users [24]. BetterBuy uses various measures to ensure that our customers' personal and financial information is protected. Here are the implementations that BetterBuy provides security with:

(1). Blockchain: This technology creates a secure and transparent record of all transactions.

(2). Secure in-app login: This creates a secure login with in-app encryption. This helps prevent unauthorized access to their accounts.

(3). Data leak cryptography: All user data, including personal information and payment details, uses high-level encryption to prevent unauthorized access and data leaks.

(4). Secure payment gateway: BetterBuy uses a secure payment gateway to process all transactions. This helps ensure that payment information is not intercepted by third parties.

(5). Two-factor authentication: BetterBuy offers two-factor authentication, which adds an extra layer of security to user accounts. This requires users to enter a code sent to their email or mobile device in addition to their username and password.

(6). Secure data storage: BetterBuy stores sensitive data in a secure location on the cloud and uses multiple cryptography methods in transactions.

(7). Secure communication: Along with cloud storage of data, there is a secure communication protocol that helps prevent eavesdropping and man-in-the-middle attacks.

(8). Code obfuscation: Obfuscating the code can make it harder for attackers to reverse engineer the app and find vulnerabilities.

(9). Regular updates: Regularly updating the app with the latest security patches and bug fixes that help ensure that the app is protected against the latest threats.

By implementing these measures, BetterBuy can help ensure that their customers' personal and financial information is protected, which can build trust and confidence in their brand.

6.4. Decentralized technology implementation

BetterBuy's use of decentralized technology provides enhanced security, transparency, and privacy for its users, helping to create a safer and more secure platform for buying and selling goods and services. Using blockchain technology in BetterBuy enhances its security in several ways: Firstly, BetterBuy will provide a decentralized, tamper-proof database that can be used to store sensitive information such as user data, transaction history, and product information. By

using blockchain, BetterBuy can ensure that this information is secure and cannot be altered or accessed without proper authorization.

Moreover, BetterBuy along with blockchain will allow for a secure and transparent transaction between buyers and sellers on the platform [24]. Each transaction is recorded on the blockchain, providing an immutable and transparent record of the transaction history. This helps to prevent fraud and disputes, as all parties can see the details of the transaction and verify its authenticity.

Finally, BetterBuy's use of blockchain allows for greater user privacy and control over their data. By storing user data on a decentralized blockchain [24], BetterBuy can ensure that users have greater control over their data and can choose to share it only with those they trust.

6.5. Sustainable impact

BetterBuy has the potential to make a significant impact on society in several ways, and it is expected to offer a range of benefits that make purchasing goods and services more accessible and convenient. One of the key advantages of the platform is increased access to goods and services, which is particularly beneficial for individuals who may not have easy access to physical stores or who have mobility issues that make it difficult to shop in person [25]. In addition to this, BetterBuy provides greater transparency and accountability, allowing consumers to compare prices and read reviews from other users, which can help them make informed purchasing decisions. This can also help hold sellers accountable for the quality of their products and services, as users can leave feedback and ratings. Moreover, the platform can also support small businesses by providing a means for them to expand their reach and connect with new customers, thereby promoting entrepreneurship and economic growth. BetterBuy also has a positive impact on the environment, reducing the need for physical storefronts and transportation-related emissions by enabling online shopping. The platform also encourages users to make environmentally conscious purchasing decisions by providing information about the environmental impact of products, such as their carbon footprint and packaging materials [26], allowing users to make informed choices that reduce their environmental impact.

BetterBuy has the potential to make a positive impact on society by increasing access to goods and services, promoting transparency and accountability, supporting small businesses, and reducing environmental impact.

7. Significance of the study

This study aims to provide an understanding of the security risks associated with using mobile platforms for sustainable e-commerce. This study can help identify these risks and provide recommendations for mitigating them. The study can also help identify the effectiveness of mobile platforms in m-commerce, and social business, and more generally, online businesses.

Moreover, informed decisions about whether to invest in mobile platforms and how to optimize their use for sustainable businesses will be easier to make.

In the research field, his study could provide insights into how to develop secure and sustainable mobile commerce platforms that promote social

responsibility and ethical business practices. Additionally, the study aims to create a social business marketplace that prioritizes user rights and security, which could inform future research on best practices for online marketplace design.

Overall, this study has the potential to inform the development of secure and sustainable mobile commerce platforms that promote social responsibility, customer trust, and ethical business practices. And can be used by researchers and practitioners to improve the effectiveness of M-Commernce by enhancing social commerce platforms.

8. Scope and limitations of the study

The scope of the study includes the examination of mobile platforms used for m-commerce and social business. The study may cover various aspects of mobile platforms, such as security features, user protection experience, and usability. The study may also include a survey of businesses and consumers who use mobile platforms for m-commerce and social business.

However, the limitations of the study include:

(1). Platform availability: The study only examines Android and iOS mobile platforms and doesn't provide an accessible website or a desktop application yet which might affect the availability and accuracy of data for the majority of users.

Participant size: The study may be limited by the sample size and representativeness of the survey respondents.

(2). Research niche: Research is mainly focused on understanding and assisting the m-commerce sustainable effectiveness and security in Southeast Asia and is more focused on Malaysia.

(3). Analysis and conclusions: The study may not be able to provide a comprehensive analysis of all security risks associated with mobile platforms, as new security threats may emerge after the study is conducted. Additionally, the study may not be able to provide a definitive answer on the effectiveness of mobile platforms in m-commerce and social business, as the success of mobile platforms may depend on various factors, such as the nature of the business and the target audience.

Overall, while the study aims to provide valuable insights into the security and effectiveness of mobile platforms in m-commerce and social business, it is important to recognize its scope and limitations.

9. Future integration

This study aims to provide an understanding of the security risks associated with using mobile platforms for sustainable e-commerce. This study can help identify these risks and provide recommendations for mitigating them. The study can also help identify the effectiveness of mobile platforms in m-commerce, social business, and, more generally, online businesses.

Moreover, informed decisions about whether to invest in mobile platforms and how to optimize their use for sustainable businesses will be easier to make.

In the research field, his study could provide insights into how to develop secure and sustainable mobile commerce platforms that promote social

responsibility and ethical business practices. Additionally, the study aims to create a social business marketplace that prioritizes user rights and security, which could inform future research on best practices for online marketplace design.

Overall, this study has the potential to inform the development of secure and sustainable mobile commerce platforms that promote social responsibility, customer trust, and ethical business practices. And can be used by researchers and practitioners to improve the effectiveness of m-commerce by enhancing social commerce platforms.

Author contributions: Conceptualization, KH and SMHA; methodology, SMHA; software, SMHA; validation, KH, SMHA and HBAJS; formal analysis, SMHA; investigation, SMHA; resources, SMHA; data curation, SMHA; writing—original draft preparation, SMHA; writing—review and editing, SMHA; visualization, SMHA; supervision, KH; project administration, HBAJS; funding acquisition, BR. All authors have read and agreed to the published version of the manuscript.

Conflict of interest: The authors declare no conflict of interest.

References

1. Cinar AC, Kara TB. The current state and future of mobile security in the light of the recent mobile security threat reports. Multimedia Tools and Applications. 2023, 82(13): 20269–20281. doi: 10.1007/s11042-023-14400-6
2. Faulds DJ, Mangold WG, Raju PS, Valsalan S. The mobile shopping revolution: Redefining the consumer decision process. Business Horizons. 2018, 61(2): 323–338. doi: 10.1016/j.bushor.2017.11.012
3. Oláh J, Kitukutha N, Haddad H, et al. Achieving sustainable e-commerce in environmental, social and economic dimensions by taking possible trade-offs. Sustainability. 2018, 11(1): 89. doi: 10.3390/su11010089
4. D'Adamo I, González-Sánchez R, Medina-Salgado MS, Settembre-Blundo D. E-commerce calls for cyber-security and sustainability: How european citizens look for a trusted online environment. Sustainability. 2021, 13(12): 6752. doi: 10.3390/su13126752
5. Joshi P, Tewari V, Kumar S, Singh A. Blockchain technology for sustainable development: A systematic literature review. Journal of Global Operations and Strategic Sourcing. 2023, 16(3): 683–717. doi: 10.1108/jgoss-06-2022-0054
6. Khanfar AA, Iranmanesh M, Ghobakhloo M, et al. Applications of blockchain technology in sustainable manufacturing and supply chain management: A systematic review. Sustainability. 2021, 13(14): 7870. doi: 10.3390/su13147870
7. Almarashdeh I, Eldaw KE, AlSmadi M, et al. Search convenience and access convenience: The difference between website shopping and mobile shopping. In: Proceedings of the Tenth International Conference on Soft Computing and Pattern Recognition (SoCPaR 2018); 13–15 December 2018; Porto, Portugal. pp. 33–42. doi: 10.1007/978-3-030-17065-3_4
8. Selvarajan S, Manoharan H, Iwendi C, et al. A comparative recognition research on excretory organism in medical applications using artificial neural networks. Frontiers in Bioengineering and Biotechnology. 2023, 11: 1211143. doi: 10.3389/fbioe.2023.1211143
9. Witkowski D. Bridging the Gap - 21st Century Wireless Telecommunications Handbook, 2nd ed. Joint Venture Silicon Valley; 2019.
10. Kumar U, Gope AK, Singh S. Emerging challenges and opportunities of mobile commerce in India: A study on societal perspective. Computing Trendz - The Journal of Emerging Trends in Information Technology. 2016, 6(1). doi: 10.21844/cttjetit.v6i1.6691
11. Ting OS, Md Ariff MS, Zakuan N, et al. Relationship between e-service quality, e-satisfaction and e-loyalty in B2C e-commerce. Advanced Science, Engineering and Medicine. 2016, 8(10): 819–825. doi: 10.1166/asem.2016.1935
12. Nikkhah HR, Balapour A, Sabherwal R. Mobile applications security: Role of privacy. In: Proceedings of the Twenty-fourth Americas Conference on Information Systems; 16–18 August 2018; New Orleans, LA, USA.
13. Ghayoumi M. Review of security and privacy issues in e-commerce. Available online: https://worldcomp-proceedings.com/proc/p2016/EEE6029.pdf (accessed on 9 September 2023).

14. D'Adamo I, González-Sánchez R, Medina-Salgado MS, et al. E-commerce calls for cyber-security and sustainability: How European citizens look for a trusted online environment. Sustainability. 2021, 13(12): 6752. doi: 10.3390/su13126752
15. Ayan B, Güner E, Son-Turan S. Blockchain technology and sustainability in supply chains and a closer look at different industries: A mixed method approach. Logistics. 2022, 6(4): 85. doi: 10.3390/logistics6040085
16. Gupta S, Kushwaha PoojaS, Badhera U, et al. Identification of benefits, challenges, and pathways in e-commerce industries: An integrated two-phase decision-making model. Sustainable Operations and Computers. 2023, 4: 200–218. doi: 10.1016/j.susoc.2023.08.005
17. Zhang J, Luximon Y, Song Y. The role of consumers' perceived security, perceived control, interface design features, and conscientiousness in continuous use of mobile payment services. Sustainability. 2019, 11(23): 6843. doi: 10.3390/su11236843
18. Grieve RH. Professor Yunus on "social business" and the conquest of poverty: A dissenting view. Available online: https://www.researchgate.net/publication/255720304_Professor_Yunus_on_social_business_and_the_conquest_of_poverty_a_dissenting_view (accessed on 12 September 2023).
19. Hai T, Zhou J, Lu Y, et al. An archetypal determination of mobile cloud computing for emergency applications using decision tree algorithm. Journal of Cloud Computing. 2023, 12(1). doi: 10.1186/s13677-023-00449-z
20. Chaudhari AR, Joshi SD. Study of effect of agile software development methodology on software development process. In: Proceedings of the 2021 Second International Conference on Electronics and Sustainable Communication Systems (ICESC); 4–6 August 2021; Coimbatore, India. doi: 10.1109/ICESC51422.2021.9532842
21. Lai ST. A maintainability enhancement procedure for reducing agile software development risk. International Journal of Software Engineering & Applications. 2015, 6(4): 29–40. doi: 10.5121/ijsea.2015.6403
22. Mahmoud MA, Al-Husseiny MM, Al-Sharafi MA. Mobile commerce (m-commerce): Overview and potential security challenges. Journal of Information Security and Applications. 2019, 49: 102–121.
23. Law FL, Kasirun ZM, Gan CK. Gamification towards sustainable mobile application. In: Proceedings of the 2011 Malaysian Conference in Software Engineering; 13–14 December 2011; Johor Bahru, Malaysia. pp. 349–353. doi: 10.1109/mysec.2011.6140696
24. Sriram VP, Sanyal S, Laddunuri MM, et al. Enhancing cybersecurity through blockchain technology enhancing cybersecurity through blockchain technology. In: Saeed S, Almuhaideb AM, Kumar N, et al. (editors). Handbook of Research on Cybersecurity Issues and Challenges for Business and FinTech Applications. IGI Global; 2022. pp. 208–224. doi: 10.4018/978-1-6684-5284-4.ch011
25. Čuček L, Klemeš JJ, Varbanov PS, et al. Significance of environmental footprints for evaluating sustainability and security of development. Clean Technologies and Environmental Policy. 2015, 17(8): 2125–2141. doi: 10.1007/s10098-015-0972-3
26. Fang D, Shi S, Yu Q. Evaluation of sustainable energy security and an empirical analysis of China. Sustainability. 2018, 10(5): 1685. doi: 10.3390/su10051685