การใช้เทคโนโลยี Blockchain ในกิจการสายการบินในประเทศไทย

The Implementation of Blockchain Technology in Thai Airlines Industry

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บทคัดย่อ

การวิจัยเชิงคุณภาพครั้งนี้มีวัตถุประสงค์เพื่อศึกษาการใช้งานเทคโนโลยี Blockchain ในการเพิ่มมูลค่า ทางการตลาดสำหรับกิจการสายการบิน และนำเสนอกลยุทธ์ในการเพิ่มมูลค่าทางการตลาดสำหรับกิจการสายการบิน ในประเทศไทยโดยใช้เทคนิคเดลฟาย ผู้ให้ข้อมูลสำคัญเป็นผู้เชี่ยวชาญจำนวน 11 ท่าน เก็บรวบรวมข้อมูลโดยใช้แบบสอบถาม ทั้งหมด 3 รอบ จากการวิจัยพบว่า การใช้เทคโนโลยี Blockchain ในกิจการสายการบินในประเทศไทย ประกอบด้วยลักษณะ การใช้เทคโนโลยี Blockchain ในการเพิ่มมูลค่าทางการตลาดสำหรับกิจการสายการบินทั้งหมด 3 ด้าน ประกอบด้วย 1) ด้าน การใช้งานเทคโนโลยี Blockchain ในอุตสาหกรรมการบิน เช่น การใช้เทคโนโลยี Blockchain ในการยืนยันตัวตนของ ผู้โดยสาร 2) ด้านกลยุทธ์ในธุรกิจสายการบิน เช่น การใช้เทคโนโลยี Blockchain ในการสนับสนุนโปรแกรมความจงรักภักดี และบริหารจัดการสิทธิประโยชน์ต่าง ๆ เพิ่มบริการทางเลือกให้แก่ลูกค้าในการสะสมคะแนนหรือแลกคะแนนสะสม 3) ด้าน เทคโนโลยีและนวัตกรรม เช่น การใช้เทคโนโลยี Blockchain เป็นข้อได้เปรียบในการพัฒนาธุรกิจและอุตสาหกรรมในประเทศ ไทยและเป็นการสร้างความแตกต่างให้กับธุรกิจขององค์กรที่นำไปใช้ทำให้มีความสามารถเหนือกว่าคู่แข่งในตลาด

คำสำคัญ: เทคโนโลยี Blockchain เทคนิคเดลฟาย กิจการสายการบิน การเพิ่มมูลค่าทางการตลาด

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Abstract

This qualitative research aims to study the application of Blockchain technology to enhance market value for the airline industry and propose strategies to increase market value for airlines in Thailand using the Delphi technique. The key informants are 11 experts. The research findings indicate that the use of Blockchain technology in the airline industry in Thailand comprises three aspects 1) Application in the Aviation Industry, for example, using Blockchain technology for passenger identity verification. 2)Business Strategy, such as using Blockchain technology to support loyalty programs and manage various benefits, providing customers with alternative services to accumulate or redeem points. 3)Technology and Innovation, such as using Blockchain technology as an advantage in business development and the aviation industry in Thailand, creating differentiation for businesses that adopt it, thus gaining a competitive edge in the market.

Keywords: Blockchain Technology, Delphi Technique, Airline Business Market, Value Enhancement

Introduction

The aviation industry in Thailand plays a crucial role in the country's economy. Historically and currently, tourism revenue is a major source of income for the country. Before the COVID-19 pandemic, in 2019, tourism revenue accounted for 16% of GDP, with international tourist revenue making up 10% of GDP (Krungthai Bank, 2020). Moreover, the aviation industry is recognized as one of the New S-Curve industries that Thailand is focusing on to drive economic growth and help the country transition from a middle-income economy to a developed one. In an era where technology and innovation are advancing rapidly, global communication and connectivity networks are increasingly important. Technology plays a vital role in every sector of business, including aviation, which must adapt to technological changes. One technology that has garnered significant attention is Blockchain, a decentralized data storage system known for its security, transparency, and lack of need for intermediaries (Department of Intellectual Property, 2019). This technology ensures data integrity by requiring that data be verified and accepted by multiple computers in the network before being recorded in the Blockchain database. Once recorded, the data cannot be altered and can be audited over time (Accenture, 2018). While Blockchain

technology is widely used in the financial industry to facilitate digital currency transactions, its applications extend far beyond this, including in medicine, transportation, public health, and education (Siam Cement Group Public Company, 2019). In Thailand, SCG has utilized Blockchain for procurement processes, resulting in reduced time and costs. In the education sector, Digital Ventures Co., Ltd., in collaboration with the Ministry of Digital Economy and Society and leading educational institutions, launched a digital platform using Blockchain to verify educational documents and prevent forgery, which is crucial for social and economic stability (BrandInside, 2018).

Globally, the aviation industry is increasingly adopting Blockchain technology. For instance, Singapore Airlines uses Blockchain in its frequent flyer program to manage promotions and benefits efficiently. Air France is experimenting with a Health Passport powered by Blockchain to facilitate COVID-19 test reporting and verification through mobile phones. British Airways has invested in and partnered with Zamna, a company using Blockchain for facial recognition to verify passenger data. Lufthansa has initiated the Blockchain for Aviation (BC4A) project to connect various industry stakeholders, including aircraft manufacturers, logistics providers, and software developers (Dla piper, 2021). Additionally, NFTs (Non-Fungible Tokens), which are unique electronic data units that cannot be replicated or substituted, are becoming increasingly popular. Emirates announced on April 14, 2022, that it would launch NFTs to enhance revenue and customer service by integrating Blockchain technology into its products and services (Emirates Airlines, 2022).

Despite the potential of Blockchain technology to enhance market value and development in the aviation sector, its application in Thai airlines remains limited. Therefore, this research aims to explore how Blockchain technology can be utilized to increase market value and create competitive advantages for Thai airlines when fully implemented in the future.

Research Objectives

1. To investigate the use of Blockchain technology in enhancing market value for the aviation industry.

2. To propose strategies for increasing market value for airlines in Thailand.

Literature Review

Knowledge of Blockchain Technology

Blockchain technology is a decentralized data system that ensures recorded information cannot be altered, using Distributed Ledger Technology (DLT). It relies on cryptography and distributed computing to maintain a consistent, immutable record visible to all participants (David Yermack, 2017). Evolving through Blockchain 1.0 (digital currencies), Blockchain 2.0 (smart contracts and asset management), and Blockchain 3.0 (various industries), it features blocks (data units), chains (transaction records), consensus (validation algorithms), and validation (data verification). Benefits include reduced reliance on intermediaries, improved data quality, integrity, and transparency, while limitations involve processing speed, high costs, immutable data, and the need for widespread data sharing (Digital Government Development Agency, 2021).

Concepts of Using Blockchain Technology in the Aviation Industry

Blockchain technology features attributes that enhance efficiency and security in aviation operations. Its key characteristics—decentralization, security, and immutability—benefit various aspects of the aviation industry. The application of Blockchain technology is focused on five main areas: 1. Managing passenger identity in conjunction with biometric systems, 2. Utilizing smart contracts for ticket issuance, 3. Tracking cargo and luggage to reduce loss and increase transparency in management, 4. Managing maintenance history and spare parts procurement, and 5. Improving airline loyalty programs by enhancing mileage programs, facilitating the use of points, and promoting customer loyalty (EOS Intelligence, 2019).

The Delphi technique

The Delphi technique is a method for forecasting future events by collecting expert opinions without the need for statistical hypothesis testing. This process involves gathering input from experts independently and without face-to-face interaction to reduce biases and achieve more neutral and reliable results. The research process includes selecting knowledgeable and willing experts, creating clear and understandable questionnaires, and conducting data collection in multiple rounds. In the first round, initial opinions are gathered using open-ended questions. In the second round, these opinions are analyzed and prioritized using scaled questionnaires. The third round involves analyzing median values and interquartile ranges, with results sent back to

experts for further review. If needed, a fourth round allows for additional review. This technique enhances research credibility through repeated consideration and appropriate expert selection. Its advantages include the ability to gather a broad range of opinions without needing meetings, ease of implementation, and fostering independent feedback, though it may face challenges such as expert fatigue from multiple rounds and difficulties in scheduling with busy experts (Krisana Suthepakul, 2011).

The airline industry strategy

In the airline industry, strategy involves planning objectives, policies, and rules to ensure competitive success and goal achievement. Strategic planning must align with operations, service, market position, and profit enhancement. Strategies are categorized into three levels: 1) Organizational Strategy: Long-term planning such as diversification and partnerships; 2) Business Strategy: Competitive advantage through cost reduction, differentiation, and market focus; 3) Operational Strategy: Short-term actions like marketing, new services, and route development. These strategies help airlines lead the industry and deliver customer value (Boonlert Jittangwattana, 2005).

Technological trends in the airline industry

Recent trends in the airline industry show that airlines are leveraging new technologies to enhance operations and profitability despite ongoing challenges. WNS Holdings (2022) highlights six key trends: 1) Biometric Systems for passenger identification; 2) Artificial Intelligence (AI) for operational efficiency; 3) Robotics and Automation for process optimization; 4) Blockchain Technology for data management and cost reduction; 5) Augmented Reality (AR) and Virtual Reality (VR) for improved passenger experiences; and 6) Internet of Things (IoT) for luggage tracking and personalized airport services (WNS Holdings, 2022).

"IGNITE THAILAND" Vision

The Thai government (2024) announced the "IGNITE THAILAND" Vision, aiming to transform Thailand into a global industrial hub and drive sustainable economic growth. This vision includes eight key goals: making Thailand a Tourism Hub by enhancing travel convenience, a Wellness & Medical Hub through comprehensive health services, and an Agriculture & Food Hub for food security. It also aims to develop Thailand as an Aviation Hub with better transit systems, a Logistic

Hub with improved infrastructure, a Future Mobility Hub for next-gen vehicle production, a Digital Economy Hub by attracting tech industries, and a Financial Hub for Southeast Asia. These efforts aim to secure Thailand's future as a regional leader (Thai government, 2024).

Research Methodology

Expert Group

Experts were selected based on their background, achievements, and recommendations from academic advisors. Using the Snowball technique, 11 experts were identified and divided into two groups:

Group 1: Aviation experts with at least 3 years of experience and Blockchain knowledge.

Group 2: Blockchain experts with experience in organizations using Blockchain or its business applications.

Research Tools

The research utilized three sets of questionnaires:

First-round questionnaire: An open-ended questionnaire designed to allow experts to freely express their opinions on the implementation of Blockchain technology in Thai airlines industry.

Second-round questionnaire: A 5-point rating scale questionnaire developed from a content analysis of responses from the first round. This questionnaire allowed experts to rate the importance of using blockchain technology to enhance market value for Thai airline businesses in each aspect.

Third-round questionnaire: A 5-point rating scale questionnaire similar to the second round but adjusted and clarified based on additional expert feedback. It also included the median and interquartile range for each item, calculated from the second round's responses, to allow experts to review and confirm their answers.

Development of Research Tools

First-Round Questionnaire

Step 1: Reviewed literature on Blockchain in the airline industry to create a framework.

Step 2: Designed an open-ended questionnaire with three sections: general expert info, opinions on Blockchain in airlines, and additional suggestions.

Step 3: Reviewed the draft with academic advisors for completeness.

Second-Round Questionnaire

Objective: Evaluate the impact of Blockchain on Thai airlines.

Process: Analyzed first-round responses, developed a 5-point rating scale questionnaire with 42 items, and revised based on advisor feedback.

Third-Round Questionnaire

Objective: Confirm findings and refine questions.

Process: Updated the second-round questionnaire with expert feedback and added Median and Interquartile Range data. Included 42 items across three areas: technology, Blockchain application in aviation, and airline strategy.

First-Round Analysis

Data from the first-round questionnaire were analyzed qualitatively. Responses were compared with literature to ensure they covered Blockchain's role in enhancing market value for Thai airlines, focusing on technology and innovation, Blockchain applications in aviation, and airline strategy.

Second-Round Data Analysis

Median Calculation: Calculated using the formula

$$\text{Md} = L + \frac{i(N/2 - \Sigma F)}{f}$$

Median scores range from 1 to 5, indicating the level of agreement on Blockchain's use to enhance market value for Thai airlines, from least (1) to most (5).

Interquartile Range (IQR) Calculation: Calculated using

$$Q_x = L_{Qx} + i\left(\frac{\frac{N}{4} - F}{f_{Qx}}\right)$$

Scores up to 1.50 indicate consensus on Blockchain's role.

Scores above 1.50 indicate disagreement.

Third-round Data Analysis

The researcher recalculated the median and interquartile range (IQR) for each item to summarize the results. Items with a median greater than 3.50 were considered significant, indicating a higher level of agreement on Blockchain's role in enhancing market value for Thai airlines. Additionally, items with an IQR of less than 1 were considered to have high consensus. Changes in responses were also assessed, with a threshold of no more than 15% variation being deemed acceptable, following the criteria established by Linestone and Turoff (1975).

Research Framework

This qualitative research explores using Blockchain to enhance market value for Thai airlines and outlines strategies based on relevant literature.


The characteristics of using blockchain technology to enhance market value for airline businesses, derived from the literature review and based on the concepts, theories, and research findings of Boonlert Jittangwattana (2005), Everett M. Rogers (2003), and EOS Intelligence (2019), include the following aspects:

1. Technology and Innovation
2. Blockchain Technology Application in the Aviation Industry
3. Aviation Business Strategies
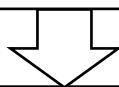
Delphi Method

The use of blockchain technology in airline businesses in Thailand, according to the perspectives of 11 experts, includes insights from:

1. Aviation experts
2. Blockchain technology experts
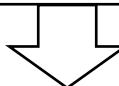
The Implementation of Blockchain Technology in Thai Airlines Industry

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Figure 1 Research framework

Research Results

The researcher summarized the results from the two expert groups' questionnaires into three aspects, detailed according to the objectives below:

1. The study concluded that the use of Blockchain technology in Thailand's airline industry to enhance marketing value can be divided into three key aspects, with all experts in agreement on the following:

1.1 Aspects of Blockchain Technology Application in the Aviation Industry

Experts placed the highest importance on all aspects of Blockchain technology use in the aviation industry. They unanimously agreed on six key points, as follows:

1) Blockchain technology ensures accurate passenger identification and enhances data security for airlines.

2) It enables precise, secure management of electronic tickets (e-tickets) and the correct storage of terms and conditions.

3) Blockchain supports airline loyalty programs by converting benefits into NFTs (Non-Fungible Tokens).

4) Smart contracts streamline airline processes like ticket sales, marketing, and payments, improving accuracy and efficiency.

5) Blockchain aids in tracking and managing digital records, such as maintenance logs and parts tracking, ensuring data accuracy.

6) It helps airlines utilize passenger data for marketing analysis and improving customer satisfaction.

1.2 Aspects of Aviation Business Strategies

Experts highly prioritized strategic aspects in the aviation industry, with unanimous agreement on ten key points, including:

1) Blockchain technology eliminates the need for paper records by digitizing ticketing and baggage tracking, enhancing operational efficiency.

2) It differentiates services by improving convenience and quality, boosting business efficiency.

3) Blockchain manages loyalty programs, tracks customer feedback, and ensures secure record-keeping, increasing customer satisfaction.

4) It supports loyalty programs by offering NFT-based rewards, providing customers with new ways to earn and redeem points.

5) Using NFTs for loyalty programs engages customers and enhances the exchange of benefits, creating excitement around promotions.

6) Blockchain reduces human errors and reliance on third parties in processes like ticket sales, marketing, and payments, cutting costs and improving operational efficiency.

7) Blockchain-secured biometrics prevent fraud, protect privacy, and ensure accurate passenger data, enhancing market value and organizational image.

8) It attracts more business partners and increases interest in the airline's products and services.

9) Proper use of Blockchain boosts competitive advantage; airlines need to invest in and understand new technologies, following regulations and safety guidelines.

10) Airlines must adapt and integrate various technologies, including Blockchain, to remain competitive and modern in the industry.

1.3 Aspects of Technology and Innovation

Experts highly prioritized technology and innovation, with unanimous agreement on ten key points, including:

1) Blockchain technology is being tested and developed to align with industry operations and address challenges.

2) Adoption of Blockchain will increase as its use cases are proven and benefits demonstrated.

3) Blockchain effectively addresses payment system issues and enhances payment security.

4) It aids in data sharing and customer identification processes, ensuring accurate verification.

5) Blockchain improves data accuracy, security, and convenient access to historical information.

6) It reduces cyber threats by preventing attacks from targeting individual computers.

7) Implementing Blockchain provides a competitive edge, differentiating businesses and advancing industries in Thailand.

8) Organizations should study and pilot Blockchain applications, planning and allocating resources appropriately.

9) Blockchain impacts the business environment and customer behavior, requiring organizations to adapt swiftly.

10) Evaluating the feasibility of new technologies is crucial for organizations to understand and effectively implement them.

2. The study concludes that strategies for increasing marketing value for airlines in Thailand are highly prioritized by experts. Their unanimous opinions outline the following strategies for enhancing marketing value for airlines in Thailand:

1) Blockchain Integration: Enhance app functionalities from ticketing to baggage handling with Blockchain, ensuring accurate and secure digital records, reducing errors and risks of data loss.

2) Service Differentiation: Use Blockchain to improve service quality and efficiency, offering a streamlined, transparent travel experience for passengers.

3) Loyalty Program Management: Implement Blockchain for managing and securing loyalty programs, tracking customer feedback, and ensuring data integrity to boost customer satisfaction.

4) NFT Rewards: Utilize Blockchain to offer NFT-based rewards, such as Frequent-Flyer Points or exclusive bonuses, providing more options for earning and redeeming points.

5) Targeted Promotions: Use Blockchain for personalized marketing, engaging customers with tailored promotions and rewards, enhancing participation and excitement.

6) Operational Efficiency: Apply Blockchain in smart contracts and other processes to reduce human errors, cut costs, and improve automation in ticket sales, marketing, and payments.

7) Biometric Security: Record biometric data on Blockchain to prevent fraud, protect passenger privacy, and ensure data accuracy, enhancing the airline's market value and image.

8) Partnership Expansion: Leverage Blockchain to establish reliable and transparent partnerships, increasing interest in airline services and expanding the customer base.

9) Competitive Advantage: Invest in Blockchain to stay competitive, ensuring proper allocation of resources, understanding technology impacts, and complying with regulations.

10) Adaptation and Innovation: Continuously adapt and integrate various technologies, including Blockchain, to maintain a competitive edge and stay modern in the industry.

Discussion and Conclusion

Aspects of Blockchain Technology Application in the Aviation Industry

The study of blockchain technology usage in the airline industry in Thailand reveals its extensive and diverse application. This aligns with the perspective of EOS Intelligence (2019), which states that blockchain can be applied beyond basic financial transactions, encompassing areas such as security, data management, ticketing, maintenance, baggage handling, and passenger loyalty programs. The study also reflects Mohsen Attaran's (2020) view that blockchain can securely coordinate and integrate information from multiple service providers, similar to Yermack's (2017) assertion that blockchain, as a Distributed Ledger Technology, ensures data security and reliability through cryptography and distributed computing. The use of blockchain in conjunction with biometric systems for identity management and security is another critical point, as highlighted by WNS Holdings (2022), which suggests that this technology can reduce privacy concerns and enhance accuracy in verification. Furthermore, the application of blockchain for automatic data management, such as identity, ownership, and membership records. The use of smart contracts on blockchain helps reduce the use of paper tickets and allows electronic tickets to be converted into tokens, including additional conditions like ticket class or lounge access. This can also reduce data sharing errors and enable real-time ticket sales (EOS Intelligence, 2019). Blockchain technology also improves loyalty programs by converting benefits into NFTs, which aligns with the International Air Transport Association's (2018) statement that blockchain can make loyalty points exchange faster and more efficient. Additionally, integrating blockchain in the aviation industry supports Thailand's vision "IGNITE THAILAND" to become a global aviation hub and is consistent with the development of a digital economy and achieving the goal of becoming a future aviation and industrial development center. Using blockchain in aviation not only enhances efficiency and reduces errors but also builds passenger confidence and boosts global competitive potential. Moreover, it contributes to creating a secure and transparent digital financial system, which is crucial for attracting foreign investment. Therefore, the development of

personnel and infrastructure is essential for Thailand to effectively utilize this technology and achieve its vision of becoming a central aviation and digital economy hub.

Aspects of Aviation Business Strategies

The study of blockchain technology usage in the airline industry in Thailand reveals that this technology plays a crucial role in enhancing the marketing value of airlines. This aligns with the concept proposed by Natthaphan Kejoranan (2009), which emphasizes the importance of strategic planning to increase market share and improve profitability. Strategic planning in the airline business should consider organizational, business, and operational strategies. Blockchain helps create differentiation in services and improve service quality, which aligns with Boonlert Jittangwattana's (2005) differentiation strategy. Introducing new services and developing service quality are key components in establishing a unique and competitive edge for airlines.

Additionally, using blockchain to manage loyalty programs by offering airline NFTs enhances options for accumulating and redeeming points, which corresponds with strategies for building strong customer relationships (Customized Products) and increasing brand loyalty. Efficiently utilizing customer spending data is a critical strategy for boosting customer satisfaction and loyalty. Blockchain technology also helps increase trade partnerships and expand distribution channels, consistent with strategic alliance strategies by collaborating with business partners to develop technology and human resources, thus increasing market opportunities and reducing investment risks. The use of blockchain in operational processes, such as through smart contracts and automation, reduces costs, increases revenue, and prevents errors, thereby improving organizational efficiency and enhancing the company's image. Implementing this technology to introduce new services and improve convenience and speed creates a competitive advantage and prevents technological obsolescence. Overall, applying blockchain technology in the aviation industry not only boosts marketing value but also modernizes and enhances management efficiency, enabling airlines to swiftly adapt to industry changes and compete effectively on a global scale.

Aspects of Technology and Innovation

The study of blockchain technology in the aviation industry in Thailand highlights that blockchain is a crucial innovation requiring knowledge and creativity for its development and integration into various industry processes. The use of blockchain in the aviation sector facilitates

the development and application of advanced technologies, aligning with the perspectives of Herkema (2003) who view innovation as the application of new ideas or technologies to develop products, services, or processes. Experimentation and development of blockchain technology to address industry challenges are vital, connecting with Dusadee Jintwiriya's (2019) research which found that external factors drive blockchain acceptance and the study of real-world applications to increase interest and implementation in procurement processes. The advantages of blockchain include data sharing capabilities, identity verification, and cyber threat reduction, which align with concepts of relative advantage and trialability of innovations. Blockchain usage accelerates operational processes and enhances data verification efficiency. Perception of blockchain's benefits is also a critical factor in its acceptance and use within the supply chain processes of the Thai automotive industry (Sowitaya Supapranie, 2017). Trust and inter-organizational relationships play significant roles in applying this technology.

Although blockchain provides a significant competitive advantage in business development and market differentiation, its implementation requires preliminary study and experimentation, along with appropriate resource planning for integrating new technologies. This aligns with Filippo Sgroi's (2022) research, which underscores the importance of learning and long-term application of innovations for market competition. Overall, adopting blockchain in the aviation industry and beyond not only enhances operational efficiency and creates differentiation but also fosters competitive capabilities in the market. Thorough understanding and experimentation with innovations are key to successful implementation of this technology.

Recommendations

1. General Recommendations

Organizational Perspective: Airlines in Thailand should begin by studying and experimenting with blockchain technology across various use cases to determine its suitability for the aviation business. A long-term strategy and effective resource allocation are essential for implementing new technologies. It is crucial to consider both internal and external factors affecting the organization. A thorough study and analysis of blockchain technology's feasibility will ensure well-informed and careful decision-making. Adopting blockchain can enhance the

business's adaptability and ability to manage changes, as well as create differentiation and add marketing value, providing a competitive edge in the market.

Business Perspective: Studying and adopting blockchain technology in the aviation industry is crucial for driving economic and social advancement, as this technology can be applied across various industries beyond just finance or aviation. The development and experimentation with blockchain will strengthen the organization's competitive capability. Incorporating this technology into the digital economy and sustainable growth strategies supports the creation of a stronger competitive position for products and services and promotes effective national economic development.

Operational Perspective: Airlines should apply blockchain technology in various areas, such as passenger authentication, ticket management, loyalty program administration, smart contracts, tracking of goods and spare parts, and data management, to enhance operational efficiency and accuracy. Blockchain usage will streamline departmental operations and improve overall efficiency, allowing airlines to gain a competitive advantage and expand their market share effectively.

2. Suggestions for Future Research

Based on the study of blockchain technology in the aviation industry in Thailand, the researchers recommend that future research should focus on specific use cases where blockchain technology is already in practical use or develop real-world pilot models. This approach will enable detailed analysis, comparison, and development of blockchain applications to maximize their benefits for organizations.

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