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| RESEARCH ARTICLE

The Adoption of Blockchain Technology in the Selected Enterprises in the Philippines: A Comparative Multi-Factor Analysis

Emmanuel P. Paulino[1] ✉ **Ronald P. Romero**[2], **Ronaldo A. Tan**[3], **Benedicto L. Avila**[4] and **Paulo Noel A. Mazo**[5]
[12345]*Pamantasan ng Lungsod ng Maynila*
Corresponding Author: Emmanuel P. Paulino, **E-mail**: eppaulino@dlsud.edu.ph

| ABSTRACT
This study investigates the effects of Technology Factors, Organizational Factors, Environmental Factors, Perceived Usefulness, Perceived Security, and Awareness on the Adoption of Blockchain Technology among top executives of companies operating in the Philippines' burgeoning blockchain sector. Using multiple linear regression analysis, the research examines how these variables influence enterprise adoption decisions and whether industry type (e.g., manufacturing, services, or finance) moderates these relationships. The results indicate that Organizational Factors, Environmental Factors, and Awareness exert significant positive impacts on blockchain adoption, whereas Technology Factors, Perceived Usefulness, and Perceived Security do not show significant effects. Moreover, the moderating role of industry type is not statistically supported. Grounded in the Technology–Organization–Environment (TOE) framework and extended adoption models, this study advances theoretical understanding of blockchain diffusion in the Philippine context and offers actionable insights for practitioners and policymakers seeking to accelerate widespread implementation. The findings underscore the importance of organizational readiness, supportive external environments, and heightened managerial awareness in driving blockchain adoption within the country's rapidly evolving digital economy.

| KEYWORDS
Blockchain Technology, Technology Factors, Organizational Factors, Environmental Factors, Adoption, Awareness, TOE Framework, Multiple Linear Regression.

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1. Introduction

Blockchain technology is increasingly recognized as a transformative force across various industries, including supply chain, finance, and manufacturing. In the Philippines, the national push for digital transformation—highlighted by initiatives from the Bangko Sentral ng Pilipinas (BSP) and the Department of Information and Communications Technology (DICT)—has brought blockchain's potential to the forefront. Its applications promise improved transparency, traceability, and operational efficiency in enterprise systems. However, despite the growing technological discourse and government interest, blockchain adoption levels remain uneven across sectors.

Scholars emphasize that blockchain adoption is not solely driven by technical readiness but is shaped by a combination of organizational capabilities, environmental pressures, and cognitive perceptions among decision-makers (Janssen et al., 2020; Agi & Jha, 2022). This multidimensional nature makes blockchain adoption a complex and context-dependent phenomenon—particularly in developing economies like the Philippines, where institutional factors, regulatory clarity, and market maturity are still evolving.

A review of the literature presents mixed findings regarding the determinants of blockchain adoption. Some studies highlight the importance of technological infrastructure and perceived usefulness (Sciarelli et al., 2022; Bag et al., 2023), while others argue

that organizational readiness and environmental support exert a stronger influence (Liu et al., 2023; Chittipaka et al., 2023). Additionally, recent research suggests that awareness and industry-specific contexts can significantly shape adoption decisions, particularly in emerging digital ecosystems (Mnif, Mouakhar, & Jarboui, 2021; Kramer, 2020). However, few studies have comprehensively integrated these factors into an empirical model to assess their combined effect on enterprise-level blockchain adoption in the Philippine context. Furthermore, the moderating role of industry—whether manufacturing, services, or finance—remains underexplored.

This study addresses these gaps by examining the direct influence of technological, organizational, environmental, cognitive (perceived usefulness and security), and awareness-related factors on blockchain adoption among Philippine enterprises. It also assesses whether industry context moderates these relationships. The research contributes to the advancement of technology adoption frameworks and offers practical insights to help Philippine organizations enhance their blockchain readiness in a rapidly digitizing economy.

2. Literature Review

2.1 Technology Factors in Blockchain Adoption

Technology factors refer to the technological characteristics that influence the decision-making process of organizations when considering the adoption of new technologies. In the context of blockchain technology, these factors involve the perceived functionalities, usability, and benefits of the system that may facilitate or hinder its integration into existing business operations. According to Janssen et al. (2020), the adoption of blockchain technology is largely driven by how well its features align with the technological requirements and expectations of organizations. These factors play a critical role in shaping organizational attitudes toward implementation, particularly in industries that rely on secure and transparent digital infrastructures.

Sciarelli et al. (2022) emphasize that organizations are more inclined to adopt blockchain when the technology demonstrates clear technical benefits and aligns with internal systems and capabilities. Malik et al. (2021) extend this perspective, highlighting the importance of technical readiness and digital infrastructure in enabling blockchain adoption. These studies underline that understanding the technological dynamics is essential for assessing how blockchain can be effectively introduced and utilized within organizational ecosystems.

Within technology factors, three sub-variables—relative advantages, compatibility, and complexity—are crucial in influencing blockchain adoption. Relative advantages refer to the perceived benefits over existing technologies, such as enhanced data security, transparency, and cost efficiency (Janssen et al., 2020; Bag et al., 2023; Maden & Alptekin, 2020; Grima et al., 2020). Compatibility pertains to the extent to which blockchain aligns with an organization's current systems and processes, significantly affecting its adoption likelihood (Sciarelli et al., 2022; Dehghani et al., 2022; Malik et al., 2021). Meanwhile, complexity involves the perceived difficulty in understanding and implementing blockchain, which often acts as a barrier to adoption due to technical uncertainty and infrastructural limitations (Choi et al., 2020; Alazab et al., 2021; Setyowati et al., 2023). Together, these sub-variables offer a comprehensive view of how technological considerations shape organizational decisions regarding blockchain integration.

2.2 Organizational Factors in Blockchain Adoption

Organizational factors refer to internal characteristics and conditions within a company that influence the decision to adopt new technologies such as blockchain. These factors encompass structural, managerial, and resource-related dimensions that determine a firm's capability and readiness to implement technological innovations. In the context of blockchain technology, organizational elements such as leadership engagement, employee expertise, availability of financial and technical resources, and organizational size can significantly shape the adoption process. According to Agi and Jha (2022), the success of blockchain implementation depends not only on the technology itself but also on the organization's internal support systems and strategic direction. Similarly, Seshadrinathan and Chandra (2021) highlight that an organization's internal culture and operational dynamics are critical enablers or inhibitors in adopting blockchain, particularly in domains like accounting and supply chain management.

Organizational factors are central components of the Technology–Organization–Environment (TOE) framework, where they represent the firm's intrinsic ability to align new technologies with its operational goals and long-term strategy. Chittipaka et al. (2023) emphasize that blockchain adoption in emerging markets is more feasible when internal organizational conditions are conducive to innovation, such as having agile decision-making processes and proactive leadership. Gökalp et al. (2022) support this view, suggesting that understanding internal organizational readiness is essential for managing the uncertainties of blockchain integration. Furthermore, Sun et al. (2022) point out that sustainable performance from blockchain adoption is deeply linked to organizational knowledge management and culture, which are part of the internal framework that supports change.

These perspectives collectively underscore that organizational preparedness is not only a background condition but a strategic determinant of successful blockchain implementation.

The key sub-variables of organizational factors—top management support, resource readiness, and organizational scale—play distinct yet interconnected roles in blockchain adoption. Top management support is essential for driving innovation, providing strategic direction, and allocating resources for blockchain projects (Malik et al., 2022; Ghode et al., 2020; Ahmed et al., 2022). Without leadership buy-in, implementation efforts often lose momentum. Resource readiness, which includes the availability of technical skills, funding, and infrastructure, enables organizations to experiment with and deploy blockchain solutions effectively (Agi & Jha, 2022; Gökalp et al., 2022; Sun et al., 2022). The lack of such resources is often cited as a major barrier to adoption. Lastly, organizational scale influences adoption likelihood, as larger firms typically have more capacity to absorb the risks and costs associated with blockchain technology (Lu et al., 2021; Younus & Raju, 2021; Chittipaka et al., 2023). These sub-variables collectively shape how organizations perceive, evaluate, and integrate blockchain into their operations, reinforcing the idea that internal organizational readiness is fundamental to digital transformation success.

2.3 Environmental Factors in Blockchain Adoption

Environmental factors refer to the external conditions, forces, and institutional frameworks surrounding an organization that can influence its decision to adopt emerging technologies like blockchain. These factors are beyond the direct control of the firm but play a crucial role in shaping its strategic responses, innovation orientation, and sustainability initiatives. In the context of blockchain technology, environmental factors often include market competition, supply chain stakeholder expectations, government policies, and socio-environmental pressures. According to Parmentola et al. (2022), the broader environmental context, especially sustainability imperatives and alignment with the Sustainable Development Goals (SDGs), has accelerated interest in blockchain adoption as a solution to enhance traceability, transparency, and accountability across industries. Likewise, Park and Li (2021) argue that blockchain adoption is increasingly driven by the external demand for improved supply chain sustainability performance, particularly as firms seek to address environmental concerns and meet stakeholder expectations.

Firms often respond to competitive market dynamics, customer expectations, partner collaborations, and regulatory environments when deciding to adopt blockchain technologies. Shojaei et al. (2021) and Khanfar et al. (2021) highlight that blockchain enables circular economy models and sustainable supply chain management, aligning companies with environmental goals that are increasingly valued in competitive markets. Moreover, Parmentola et al. (2022) emphasize the importance of institutional pressures and governmental frameworks in legitimizing the use of blockchain as an enabler of environmental sustainability. Yontar (2023) points out that stakeholder engagement and ecosystem readiness are environmental catalysts for blockchain diffusion, particularly in the agri-food supply chain sector. These findings underscore that blockchain adoption is not merely a technological decision but a strategic response to a complex and evolving external environment.

Environmental factors in blockchain adoption can be further examined through three key sub-variables: competitive pressure, partner pressure, and regulatory support. Competitive pressure motivates companies to adopt blockchain to maintain or enhance their market position by differentiating through sustainability and operational transparency (Bai et al., 2020; Mubarik et al., 2021; Sharma et al., 2020). Partner pressure refers to the influence of supply chain stakeholders, such as suppliers, distributors, and customers, who demand greater visibility and environmental accountability—factors that blockchain technology can effectively address (Yontar, 2023; Guo et al., 2020; Benzidia et al., 2021).

Regulatory support, meanwhile, plays a pivotal role in reducing uncertainties and encouraging adoption through environmental compliance requirements and digital innovation incentives (Parmentola et al., 2022; Shojaei et al., 2021; Khanfar et al., 2021). Collectively, these sub-variables illustrate how external environmental dynamics significantly drive the adoption of blockchain technologies, especially in industries where sustainability, collaboration, and compliance are critical to long-term competitiveness.

2.4 Perceived Usefulness in Using Blockchain Technology

Perceived usefulness (PU) is defined as the degree to which an individual or organization believes that using a particular technology will enhance their job performance or operational efficiency. Within the framework of the Technology Acceptance Model (TAM), perceived usefulness plays a central role in influencing users' behavioral intention and actual adoption of technology. In the context of blockchain technology, perceived usefulness reflects how end-users, employees, or managers view blockchain's ability to improve transparency, trust, efficiency, and decision-making across different sectors such as banking, education, supply chains, and accounting. Garg et al. (2021) assert that perceived benefits such as enhanced transaction security, data immutability, and operational efficiency contribute significantly to positive perceptions about blockchain's usefulness in the

banking sector. Similarly, Junejo et al. (2023) highlight the role of blockchain-enabled collaboration in enhancing supply chain efficiency, where perceived usefulness mediates the link between technological integration and performance improvement.

Furthermore, perceived usefulness is often shaped by contextual factors such as task relevance, stakeholder expectations, and organizational readiness. Roshanak et al. (2024) argue that marketing mix elements influence users' perceived usefulness of blockchain, particularly when technological value is effectively communicated to the target users. In educational settings, Kumar et al. (2021) emphasize that trust, perceived security, and privacy significantly influence perceived usefulness, which in turn drives the intention to adopt blockchain solutions. Taherdoost (2022) adds that various blockchain adoption frameworks confirm the pivotal role of perceived usefulness in shaping favorable attitudes toward technology use across industries, including logistics, auditing, and education. These insights highlight the multifaceted and dynamic nature of perceived usefulness as it relates to organizational goals, user expectations, and strategic implementation.

The literature also establishes strong connections between perceived usefulness and its sub-variables: performance expectation, technological capabilities, and facilitating conditions. Performance expectation, or the belief that blockchain will lead to concrete improvements in business processes, has been shown to significantly drive PU (Junejo et al., 2024; Raddatz et al., 2023). For instance, users in food supply firms perceive blockchain as beneficial due to its potential to streamline operations and improve traceability (Junejo et al., 2024). Technological capabilities, which encompass the robustness, scalability, and security of blockchain systems, enhance users' confidence in the technology's utility (Garg et al., 2021; Ullah et al., 2021). In smart learning environments, the integration of blockchain with other intelligent technologies reinforces its perceived usefulness by supporting secure and efficient digital interactions (Ullah et al., 2021). Finally, facilitating conditions, including organizational support, infrastructure, and policy alignment, also shape PU perceptions. Ferri et al. (2021) found that within the Big 4 accounting firms in Italy, institutional support and clear guidelines significantly influence auditors' perceived usefulness of blockchain systems. Together, these sub-variables explain how perceived usefulness functions as a critical mediator in the adoption and sustained use of blockchain technologies across various organizational settings.

2.5 Perceived Security in Using Blockchain Technology

Perceived Security is defined as the degree to which users believe that a blockchain system is secure enough to protect information, transactions, and organizational operations from unauthorized access, breaches, or misuse. Within the Technology Adoption Model (TAM), perceived security is a critical determinant of users' trust, influencing their behavioral intention to adopt emerging technologies such as blockchain. In the blockchain context, perceived security encompasses multiple dimensions, including information security, transaction security, and organizational security, which collectively shape users' confidence in the technology's ability to safeguard sensitive data and processes.

Research consistently highlights the pivotal role of information security in shaping perceived security. For instance, Kumar et al. (2021) emphasize that trust, perceived privacy, and security concerns significantly influence users' adoption intentions in higher education settings, pointing to the importance of robust data protection mechanisms. Similarly, Ooi et al. (2021) found that individuals' willingness to embrace blockchain-based cryptocurrencies like Bitcoin is highly influenced by their perception of information security and the system's ability to prevent data manipulation. Esfahbodi et al. (2022) extend this notion to E-commerce, where concerns over personal data protection directly impact consumer trust and their intention to use blockchain platforms.

Transaction security—the confidence that blockchain can protect financial and operational transactions—emerges as another key sub-variable. Mashatan et al. (2022) empirically confirm that perceptions of transaction privacy and security significantly determine consumers' trust in crypto-payments. Similarly, Rodríguez Bolívar et al. (2025) examine the tourism industry and find that trust in transaction security plays a vital role in blockchain acceptance. Users are more likely to engage with blockchain-based booking and payment systems when they perceive transactions as secure and immutable. In the marketing domain, Jha et al. (2025) caution against overstating blockchain's security capabilities, emphasizing that unrealistic expectations may backfire and reduce users' sense of transactional reliability.

Organizational security, or the belief that blockchain enhances institutional-level safeguards, is also critical. Razali et al. (2021) propose a secure data-sharing model for intelligence agencies, demonstrating how blockchain is perceived to fortify organizational resilience against cyber threats. In a healthcare context, although the study by Mustafa et al. (2022) was retracted, its focus on the role of blockchain in cloud storage systems reflected an intent to explore blockchain's perceived ability to secure organizational systems. Furthermore, Shin and Hwang (2020) demonstrate how blockchain's traceability and tamper-resistance contribute to organizational confidence, reinforcing secure digital affordances in service delivery.

Cognitive and psychological drivers also intersect with perceived security. Marikyan et al. (2022) explore how individual-level decision-making regarding blockchain adoption is deeply rooted in cognitive evaluations of trustworthiness and technological risk. When users perceive a technology as secure, they are more likely to engage with it, form trust-based relationships, and sustain long-term usage. This is further supported by the findings of Mashatan et al. (2022), who argue that perceptions of privacy and security are not only technical but also shaped by user experience and risk awareness.

Together, these studies highlight that perceived security is not a monolithic construct but rather a multifaceted perception shaped by information confidentiality, transactional integrity, and institutional reliability. As a result, addressing all three sub-variables—information security, transaction security, and organizational security—is essential for building trust and encouraging the adoption of blockchain across sectors such as education (Kumar et al., 2021), tourism (Rodríguez Bolívar et al., 2025), healthcare (Mustafa et al., 2022), and finance (Mashatan et al., 2022). By enhancing perceived security, organizations can reduce adoption resistance, strengthen stakeholder confidence, and unlock the full potential of blockchain technologies.

2.6 Awareness of Blockchain Technology

Awareness of Blockchain Technology refers to the extent to which individuals or organizations are familiar with the concept, features, applications, and implications of blockchain systems. This construct plays a foundational role in shaping users' perceptions, attitudes, and behavioral intentions toward adopting blockchain-based innovations. In the context of digital transformation across sectors such as supply chains, finance, education, and smart environments, blockchain awareness serves as a critical precursor to technology acceptance and implementation readiness.

Kramer (2020) defines public awareness of blockchain as general familiarity with its decentralized features, security capabilities, and potential for disrupting traditional systems. This baseline knowledge contributes to forming user perceptions about the trustworthiness and relevance of blockchain technologies. Similarly, Bahtiyar et al. (2020), through a survey among students, found that awareness significantly affects attitudes toward future blockchain learning and adoption, suggesting that public education and exposure influence openness to technology.

Another key sub-variable, technology literacy, highlights the role of users' understanding of technical attributes and operational mechanisms of blockchain systems. Kumari et al. (2023) demonstrate that success factors such as technology awareness and financial literacy are significant predictors of cryptocurrency adoption, underscoring the importance of user preparedness in interpreting blockchain's functionality. Wilczyński and Kołodziej (2020) add that awareness of blockchain's role in enhancing secure cloud computing operations is essential for informed adoption, especially in complex infrastructures like cloud and edge computing.

Social media exposure, particularly on platforms such as Twitter, is another sub-variable shaping awareness. Mnif et al. (2021) utilized Twitter analytics to analyze public sentiment and information diffusion related to blockchain, revealing that awareness levels can vary significantly based on social influence, digital discourse, and trending topics. Shaik and Kumar (2021) further confirm that blockchain awareness is growing across business sectors due to heightened visibility in digital media and organizational strategies.

Furthermore, application-specific awareness captures how awareness is influenced by specific blockchain use cases, such as in supply chains, healthcare, smart energy systems, or the Internet of Things (IoT). Fan et al. (2022) explain that consumers' awareness of traceability capabilities in blockchain systems can directly affect supply chain adoption decisions. Similarly, Sisi and Souri (2024) discuss blockchain's role in energy-aware mobile crowd sensing, indicating that awareness of sustainability-enhancing features encourages positive attitudes among environmentally conscious users. Shahbazi and Byun (2020) contribute by highlighting awareness in secure routing protocols in wireless health monitoring, where specific use-case understanding drives acceptance.

Jang et al. (2023) further point out that external pressures and climate change awareness can moderate resistance to blockchain, suggesting that environmental context and societal narratives shape technology awareness. Nguyen et al. (2020) explore blockchain innovation within the emerging 6G network landscape, emphasizing that privacy-aware design awareness is critical for strategic deployment. Similarly, Sturm et al. (2020) and Falazi et al. (2020) argue that awareness of blockchain's integration into business process modeling enhances operational readiness and architecture planning.

2.7 Adoption to Blockchain Technology

Adoption of Blockchain Technology has emerged as a significant area of inquiry, particularly as organizations across sectors aim to enhance transparency, efficiency, and security. Adoption refers to the process through which individuals or organizations

become aware of, evaluate, decide upon, and incorporate blockchain technology into their systems and processes. This process is generally explored through key sub-variables: intention to use, implementation, and actual usage.

Intention to use reflects the pre-adoption attitudes and behavioral inclinations toward blockchain technology. Several studies emphasize the importance of perceived benefits, social influence, and technological readiness in shaping intention. Jena (2022), through an extended UTAUT model, found that performance expectancy, effort expectancy, and facilitating conditions significantly influence users' intentions to adopt blockchain in the banking sector. Similarly, Khalil, Khawaja, and Sarfraz (2022) demonstrated that intention is mediated by technological readiness and trust, particularly within the financial sector during the Fourth Industrial Revolution.

Taherdoost (2022) reviewed multiple blockchain adoption frameworks and concluded that users' intentions are often shaped by a mix of socio-technical factors, including security concerns, cost efficiency, and perceived innovativeness. Dehghani et al. (2022) noted that although many firms exhibit a high level of interest in blockchain, this does not always translate into adoption, due to organizational inertia and knowledge gaps, thereby creating a disparity between interest and behavioral intention.

Implementation captures the process through which blockchain solutions are operationalized within organizational infrastructures. Janssen et al. (2020) proposed a comprehensive framework that integrates institutional, market, and technical factors, emphasizing that the regulatory environment, market readiness, and technological infrastructure critically affect the adoption journey. AlShamsi, Al-Emran, and Shaalan (2022), in a systematic review, found that organizational support, change management capabilities, and inter-organizational collaboration are central to successful blockchain implementation across domains.

The construction industry provides a relevant example where implementation is shaped by broader socio-political and environmental contexts. Teisserenc and Sepasgozar (2021) employed the PESTELS approach and identified factors such as political regulation, technological readiness, and environmental impact as key enablers or barriers to blockchain implementation through digital twins. Likewise, Rijanto (2021) emphasized that in the agroindustry, implementation depends heavily on access to financing and the alignment between blockchain benefits and business priorities.

Actual usage pertains to the sustained and practical application of blockchain systems after implementation. This includes daily operations, system integration, and user engagement. Liu et al. (2023) highlighted that collaborative contracts in supply chains promote continuous blockchain usage by aligning stakeholder incentives and reducing information asymmetry. Akram et al. (2020) mapped out opportunities and challenges in various sectors, stressing that actual usage often hinges on interoperability, scalability, and stakeholder engagement.

Jimoh, Abdullahi, and Ibrahim (2020) further stressed that actual adoption in developing countries remains constrained by infrastructural and educational limitations, despite growing interest. This is echoed in the findings of Dehghani et al. (2022), who observed that cultural and organizational resistance impedes full-scale usage. In contrast, AlShamsi et al. (2022) reported that sectors with high digital maturity and top management support experience smoother transitions from implementation to actual use.

2.8 Theory

To examine the adoption of blockchain technology, this study adopts two prominent theoretical frameworks: Technology Acceptance Model (TAM) and the Technology-Organization-Environment (TOE) framework.

The Technology Acceptance Model (TAM), introduced by Davis (1989) and extensively reviewed and extended in recent years, serves as a foundational model for understanding technology adoption behavior across various domains. According to TAM, the primary determinants influencing users' intention to adopt a new technology are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). In the context of blockchain adoption, Natasia et al. (2022) and Granić and Marangunić (2020) highlight that perceived usefulness significantly shapes individuals' belief that blockchain technology enhances performance, efficiency, and value creation. Han and Sa (2022) further validate the role of satisfaction and usefulness in technology acceptance within digital environments. The model has been consistently applied across sectors, as seen in the works of Musa et al. (2024) and Rafique et al. (2020), revealing its applicability in explaining user behavior across education, healthcare, and digital platforms.

In blockchain-specific contexts, Kamal et al. (2020) and Scherer et al. (2020) demonstrate that when users believe blockchain solutions are easy to navigate and deliver tangible benefits, adoption rates increase. Guner and Acarturk (2020) show that TAM can be adapted across different user demographics, making it suitable for organizations dealing with diverse user bases. The

extended versions of TAM also incorporate other constructs such as trust, user attitude, and intention to use, offering a more robust framework to explore blockchain-related innovations.

Complementing TAM, the Technology-Organization-Environment (TOE) framework, initially developed by Tornatzky and Fleischer (1990), provides a broader organizational lens to examine technology adoption by accounting for technological, organizational, and environmental contexts. The technological context includes the availability, complexity, and compatibility of blockchain systems (Ahmed, 2020; Wulandari et al., 2020), aligning with the TAM concept of perceived usefulness and ease of use. Technological capabilities, such as scalability and security, are critical drivers of blockchain readiness and influence performance expectations and perceived benefits (Nguyen et al., 2022; Saetang et al., 2020).

The organizational context, as discussed by Al Hadwer et al. (2021), encompasses internal resources, leadership support, and the innovative culture that fosters blockchain implementation. Setiyani and Rostiani (2021) found that small and medium-sized enterprises (SMEs) with adequate technical know-how and management support are more likely to adopt blockchain solutions. Aligarh et al. (2023) support this by showing how organizational readiness translates to improved technology deployment outcomes and better firm performance.

The environmental context includes external pressures such as regulatory requirements, industry competition, and customer expectations. Ng et al. (2022) and Wulandari et al. (2020) demonstrate that external digital pressure and technological trends significantly influence firms' willingness to embrace blockchain as a strategic response to evolving market demands.

2.9 Hypothesis

2.9.1 Technology Factors on Adoption of Blockchain Technology

Studies consistently emphasize the critical role of technological factors in driving blockchain adoption. Sciarelli et al. (2022) and Maden and Alptekin (2020) highlight the importance of technological readiness, perceived ease of use, and infrastructure in shaping adoption decisions through TAM and fuzzy DEMATEL approaches. Bag et al. (2023) further support this by linking technological capabilities with SME performance in logistics. Choi et al. (2020) expand this perspective by examining resistance to adoption in supply networks, indicating that perceived complexity and lack of interoperability hinder implementation. Dehghani et al. (2022) and Akram et al. (2020) affirm that despite high interest, technological barriers remain, particularly in terms of scalability and integration. Taherdoost (2022) contributes a meta-analysis of various blockchain frameworks, reaffirming technology's foundational role in adoption.

However, discrepancies exist regarding the influence of these technological factors across contexts. For instance, while Choi et al. (2020) identified technical resistance in supply networks, Akram et al. (2020) found more widespread opportunities, suggesting varying levels of perceived technological benefit. Jimoh et al. (2020) also emphasize broader awareness but point to slow uptake due to insufficient technical skills. Meanwhile, Maden and Alptekin (2020) stress that technical decisions are highly context-dependent, while Dehghani et al. (2022) argue that decision-makers' lack of technical expertise hinders progress. These contradictions suggest that technological influence is necessary but insufficient on its own, requiring supportive organizational and external enablers to result in successful adoption.

H1: Technology factors have a significant effect on adoption of blockchain technology

2.9.2 Organizational Factors on Adoption of Blockchain Technology

Organizational elements—such as leadership commitment, resource availability, and strategic alignment—are widely recognized as vital to blockchain adoption. Janssen et al. (2020) and Agi and Jha (2022) propose integrated frameworks combining institutional, market, and internal drivers to assess adoption. Malik et al. (2022) and Khalil et al. (2022) emphasize that blockchain implementation is often contingent upon organizational readiness and vision, particularly in sectors like finance and supply chain. Seshadrinathan and Chandra (2021) support this by examining accounting applications, finding that adoption increases when blockchain is compatible with existing workflows. Chittipaka et al. (2023) confirm these insights through empirical evidence from emerging markets, reinforcing the influence of internal structure and cross-functional coordination.

Nonetheless, contradictions arise concerning how organizations perceive and implement blockchain. While Liu et al. (2023) found collaborative contracts to be an organizational enabler, Sun et al. (2022) note that knowledge management must accompany adoption efforts to produce meaningful performance outcomes. AlShamsi et al. (2022) show that despite internal support, many firms hesitate to adopt due to unclear long-term benefits. These contrasting results reveal that while organizational support is a key facilitator, it must be paired with environmental and technical readiness to succeed.

H2: Organizational factors have a significant effect on adoption of blockchain technology

2.9.3 Environmental Factors on Adoption of Blockchain Technology

Environmental considerations—such as regulatory support, sustainability goals, and external market pressure—strongly affect blockchain adoption. Parmentola et al. (2022) and Yontar (2023) highlight blockchain's potential to enhance environmental sustainability and circular supply chains. Mubarik et al. (2021) provide evidence from emerging economies, showing that blockchain can enhance green practices in supply chains. Similarly, Bai et al. (2020) and Park and Li (2021) link blockchain with improved sustainability performance in business strategies. Teisserenc and Sepasgozar (2021) use a PESTELS approach to show how environmental legislation drives blockchain adoption in construction.

However, the environmental impact is not uniformly emphasized across industries. Rijanto (2021) finds that agro-industries adopt blockchain primarily for financial efficiency, with sustainability benefits viewed as secondary. Khalil et al. (2022) also note that in finance, environmental benefits are often indirect or overlooked. Jena (2022) adds that the effect of environmental factors depends on institutional trust and regulatory enforcement. These varying perspectives suggest that while environmental pressures can serve as catalysts, their influence is often sector-specific and secondary to economic and organizational motivations.

H3: Environmental factors have a significant effect on adoption of blockchain technology

2.9.4 Perceived Usefulness on Adoption of Blockchain Technology

Perceived usefulness has emerged as a powerful cognitive factor in shaping blockchain adoption decisions. Garg et al. (2021) and Junejo et al. (2024) demonstrate that perceived benefits—such as enhanced transparency, efficiency, and performance—significantly drive intention to adopt blockchain in sectors like banking and food supply chains. Roshanak et al. (2024) reveal that marketing strategies can enhance adoption by increasing perceived usefulness. Liu et al. (2023) and Junejo et al. (2023) show that perceived usefulness mediates the relationship between blockchain collaboration and supply chain performance, especially in operational contexts.

Nevertheless, the extent of this influence varies. While Kumar et al. (2021) emphasize perceived usefulness in higher education, Rijanto (2021) shows that in agro-industries, usefulness must be linked with financing opportunities to matter. Teisserenc and Sepasgozar (2021) note that usefulness is contingent upon digital maturity and integration into Industry 4.0 tools. These inconsistencies indicate that while perceived usefulness is essential, it is not a standalone predictor and must be supported by contextual and operational alignment.

H4: Perceived usefulness have a significant effect on adoption of blockchain technology

2.9.5 Perceived Security on Adoption of Blockchain Technology

Perceived security plays a vital role in shaping blockchain acceptance, particularly in trust-sensitive industries. Kumar et al. (2021) and Jha et al. (2025) highlight how perceived trust, privacy, and data integrity influence user intention in education and marketing systems. Rodríguez Bolívar et al. (2025) show that in tourism, security concerns shape managerial decisions regarding blockchain implementation. Mashatan et al. (2022) provide empirical evidence from crypto-payments, linking perceived security with consumer trust. Ooi et al. (2021) reinforce this, showing that user trust in Bitcoin hinges on perceived security guarantees.

However, scholars caution against overestimating security perceptions. Taherdoost (2022) and Janssen et al. (2020) argue that security perceptions are often based on assumptions rather than technical understanding. Liu et al. (2023) stress that without strong regulatory frameworks, perceived security can be misleading. AlShamsi et al. (2022) find that organizations may over-rely on security narratives while under-investing in actual protective infrastructure. These tensions suggest that while security is a major perceived benefit, its influence depends heavily on how it is understood and implemented in practice.

H5: Perceived security have a significant effect on adoption of blockchain technology

2.9.6 Awareness on Adoption of Blockchain Technology

Awareness is a foundational precursor to blockchain adoption, shaping both interest and intention. Kramer (2020) and Mnif et al. (2021) emphasize that public and institutional awareness, often fueled by social media, is key to driving early-stage adoption. Kumari et al. (2023) found that awareness and financial literacy are key drivers of cryptocurrency adoption, while Fan et al. (2022) noted consumer traceability awareness as an important motivator for supply chain blockchain usage. Bahtiyar et al. (2020) support this through evidence of increased student engagement in blockchain discussions after awareness campaigns.

However, high awareness does not always translate into actual adoption. Dehghani et al. (2022) identified a significant "interest-action" gap, where stakeholders recognize blockchain's value but hesitate to implement due to complexity and uncertainty. Shaik

and Kumar (2021) and Jimoh et al. (2020) affirm this, noting that in many sectors, awareness is not accompanied by sufficient technical understanding or institutional support. These findings indicate that while awareness is a necessary condition for adoption, it must be accompanied by education, strategic guidance, and infrastructure development to yield tangible outcomes.

H6: Awareness have a significant effect on adoption of blockchain technology

2.9.7 Moderating Effect of Industry on Blockchain Technology Adoption

Several studies emphasize that industry context significantly moderates the relationship between adoption factors and blockchain implementation success. Baig and Yadegaridehkordi (2023) observed that Industry 4.0 adoption positively moderates the impact of blockchain on sustainability in Malaysian manufacturing firms. Yuan and Zhang (2020) highlight how flexible environmental policies and regulatory enforcement shape the success of blockchain in Chinese industries. Ch'ng et al. (2021) found that market turbulence influences how eco-innovation, including blockchain, contributes to business performance. Hernández-Linares et al. (2021) demonstrate that market orientation moderates the link between dynamic capabilities and SME performance.

Still, the moderating influence of industry is not uniformly understood. While Narayanamurthy and Tortorella (2021) observed that the COVID-19 crisis and base technologies enhanced employee performance in some sectors, other industries struggled to integrate blockchain meaningfully due to structural or cultural barriers. These contrasting findings highlight that while blockchain benefits are theoretically consistent, their realization is highly contingent on industry characteristics, operational readiness, and external volatility.

H7: Industry have a significant moderating effect on adoption of blockchain technology

3. Methodology

3.1 Research Participants and Data

The participants of this study were top management or executives from various companies operating in the Philippines. Their involvement provided the researchers with reliable and relevant data to support the completion of the study. Respondents completed a survey questionnaire that assessed their perceptions of technology, organizational, and environmental factors, perceived usefulness, perceived security, awareness, and adoption of blockchain technology.

A total of 111 respondents participated in the study, which exceeds the minimum sample size of 72, determined through priori statistical power analysis using G Power with power = .95, effect size = .15, and α = .05. Statistical power analysis is the appropriate method for calculating the sample size when the goal is hypothesis testing and ensuring reliable results (Cohen, 1992; Barker et al., 2016).

3.2 Statistical Treatment

The study employed Multiple Linear Regression to analyze the relationship between several independent variables and a single dependent variable. This statistical method enables the assessment of how strongly each independent variable is associated with the dependent variable, while accounting for the effects of the other predictors. It also helps determine the individual contribution of each independent factor, offering a clearer understanding of their influence within the overall model.

3.3 Data Analysis

3.3.1 Direct Path

Table 1. Multiple Regression Results

Predictor	Estimate	SE	t	p	Interpretation
Intercept [a]	9.59E-04	0.300	0.003	0.997	
Technology factors	-0.1226	0.098	-1.249	0.213	H1 Rejected
Organization factors	0.4472	0.105	4.243	< .001	H2 Accepted
Environmental factors	0.5511	0.110	4.998	< .001	H3 Accepted
Perceived Usefulness	0.0406	0.128	0.317	0.752	H4 Rejected
Perceived Security	0.1170	0.091	1.285	0.200	H5 Rejected
Awareness	0.0300	0.106	3.258	0.007	H6 Accepted

Table 1 displays the results of the multiple regression analysis used to examine the influence of various predictors on the adoption of blockchain technology. The findings show that technology factors do not have a significant effect on adoption (β = -0.1226; p = 0.213), indicating that changes in technology-related factors do not significantly predict blockchain adoption. Therefore, H1 is rejected.

In contrast, organizational factors demonstrate a significant positive influence on blockchain adoption (β = 0.4472; p < 0.001). This means that a one-unit increase in organizational readiness or support corresponds to a 0.4472 increase in adoption. Thus, H2 is accepted.

Likewise, environmental factors show a strong and significant positive relationship with blockchain adoption (β = 0.5511; p < 0.001). This suggests that greater environmental pressure or support results in higher adoption levels. Hence, H3 is accepted.

However, perceived usefulness does not significantly impact blockchain adoption (β = 0.0406; p = 0.752), indicating that the perceived benefits of blockchain do not directly influence adoption in this context. As a result, H4 is rejected.

Similarly, perceived security fails to show a statistically significant effect on adoption (β = 0.1170; p = 0.200). This suggests that security concerns or trust in the technology do not significantly influence adoption decisions, leading to the rejection of H5.

Finally, awareness has a significant positive influence on blockchain adoption (β = 0.0300; p = 0.007). This indicates that increased awareness about blockchain technology is associated with a greater likelihood of adoption. Therefore, H6 is accepted.

3.3.2 Indirect Path

Table 2. Moderating effect of the industry to each factor on adoption blockchain technology

Predictor	Estimate	SE	t	p	Interpretation
Manufacturing – Supply Chain	0.1066	0.0847	1.25901	0.209	
Service – Supply Chain	-0.0418	0.0821	-0.50933	0.611	H7 Rejected
Finance – Supply Chain	-0.0206	0.0835	-0.24684	0.805	

Table 2 presents the results of the regression analysis examining the moderating effect of industry type on the adoption of blockchain technology. The findings show that the manufacturing supply chain industry does not have a statistically significant

moderating effect on adoption (β = 0.1066; p = 0.209). Although the coefficient is positive, suggesting a potential increase in adoption within the manufacturing sector, the relationship is not significant. Therefore, H7 is rejected.

Additionally, results for the service supply chain industry reveal a negative but non-significant effect on blockchain adoption (β = -0.0418; p = 0.611), indicating that operating in the service sector does not significantly alter the relationship between the predictors and blockchain adoption.

Similarly, the finance supply chain industry also shows a non-significant effect (β = -0.0206; p = 0.805), suggesting no meaningful moderating impact on blockchain adoption. These results imply that industry type does not significantly moderate the relationship between the influencing factors and the adoption of blockchain technology in this study's context.

4. Conclusion

4.1 Technology Factors to Adoption of Blockchain Technology

Technology factors do not significantly influence the adoption of blockchain technology in the blockchain industry. The study found that technological considerations, such as system complexity or compatibility, had no meaningful impact on adoption decisions. This contradicts prior research that typically highlights technology readiness as a critical enabler of adoption (Sciarelli et al., 2022; Maden & Alptekin, 2020). The result suggests that in the context of the blockchain industry—where technological innovation is expected—technology alone may not drive adoption without the presence of other supporting factors.

4.2 Organizational Factors to Adoption of Blockchain Technology

Organizational factors significantly influence the adoption of blockchain technology in the blockchain industry. The findings demonstrate that internal readiness, leadership commitment, and resource availability within organizations contribute positively to adoption. This is consistent with earlier studies that emphasize the role of organizational structure and strategic alignment in facilitating technology adoption (Agi & Jha, 2022; Malik et al., 2022). The result highlights that companies in the blockchain industry must strengthen internal capabilities to support successful implementation.

4.3 Environmental Factors to Adoption of Blockchain Technology

Environmental factors have a significant and positive impact on blockchain technology adoption. This suggests that external pressures, such as competitive dynamics, regulatory influence, and market demand, play a vital role in motivating organizations to adopt blockchain. The finding aligns with prior research that underlines the importance of institutional and environmental conditions in shaping technology adoption behavior (Parmentola et al., 2022; Chittipaka et al., 2023). Firms in the blockchain industry must stay responsive to environmental trends and policy shifts to remain competitive and innovative.

4.4 Perceived Usefulness to Adoption of Blockchain Technology

Perceived usefulness does not significantly affect blockchain technology adoption in the blockchain industry. Although traditionally considered a strong predictor of technology acceptance, this study found no substantial evidence linking perceived benefits to adoption behavior. This finding diverges from the established Technology Acceptance Model (TAM) and contradicts earlier studies (Garg et al., 2021; Roshanak et al., 2024), suggesting that in an industry already embedded in blockchain innovation, usefulness may be taken for granted rather than seen as a decisive factor.

4.5 Perceived Security to Adoption of Blockchain Technology

Perceived security was not found to significantly influence blockchain technology adoption. Despite previous studies emphasizing trust and data protection as critical elements for adoption (Mashatan et al., 2022; Kumar et al., 2021), the result suggests that in the blockchain industry—where security is a built-in feature—the perception of security may not differentiate adoption decisions. Organizations may already assume a baseline level of security, making other factors like strategic fit and regulation more decisive.

4.6 Awareness to Adoption of Blockchain Technology

Awareness significantly influences the adoption of blockchain technology in the blockchain industry. Increased awareness about blockchain applications, benefits, and operational value leads to a higher likelihood of adoption. This supports prior research that underscores the role of technological awareness in shaping adoption decisions (Kumari et al., 2023; Kramer, 2020). Enhancing awareness campaigns, industry education, and stakeholder engagement can thus serve as effective tools to accelerate blockchain adoption across sectors.

4.7 Industry Type as a Moderator

The moderating effect of industry type—whether manufacturing, service, or finance—was not significant in this study. None of the industry categories meaningfully altered the relationship between the influencing factors and blockchain technology adoption. This result indicates that, within the blockchain industry, the drivers of adoption may be more universally applicable across sectors than previously assumed (Ijaz Baig & Yadegaridehkordi, 2023; Ch'ng et al., 2021). Thus, while industry-specific challenges exist, they may not significantly reshape the core adoption dynamics of blockchain technology.

4.8 Implications

4.8.1 For Theory Development

This study contributes to the development and contextual validation of several technology adoption theories, particularly the Technology-Organization-Environment (TOE) Framework, the Technology Acceptance Model (TAM), and elements of the Diffusion of Innovation (DOI) Theory. The significant influence of organizational and environmental factors on blockchain adoption supports the TOE framework, affirming that both internal readiness and external pressures are critical drivers of technology uptake (Janssen et al., 2020; Agi & Jha, 2022). However, the non-significant effect of technological factors challenges conventional assumptions of the TOE model, suggesting that in the blockchain industry, technological readiness may be assumed and less decisive. The rejection of perceived usefulness and perceived security as predictors also contrasts with TAM assumptions, indicating that in a technologically mature sector, these variables may not hold the same predictive power. Conversely, the significant impact of awareness aligns with DOI theory, reinforcing the idea that communication and understanding of an innovation are essential for its diffusion. Together, these results offer a refined theoretical perspective on blockchain adoption, highlighting context-specific nuances that extend the application of traditional models.

4.8.2 For Business and Management Practice

The findings emphasize the importance of organizational preparedness and responsiveness to environmental dynamics in driving blockchain adoption. Managers in the blockchain industry must recognize that internal enablers—such as leadership commitment, infrastructure readiness, and change management—play a more pivotal role than technological sophistication alone. Moreover, firms should stay alert to external regulatory, market, and competitive conditions, which significantly shape adoption decisions. Awareness-building emerges as a critical strategic tool: businesses should invest in targeted education, training, and communication initiatives that promote a clear understanding of blockchain's benefits and applications. The findings also suggest that relying solely on perceived technical advantages like usefulness and security is insufficient; organizations need to focus more on building capacity and industry alignment. These insights provide actionable guidance for managers seeking to optimize their technology adoption strategies and remain competitive in a rapidly evolving digital economy.

4.8.3 For Blockchain Industry

For the blockchain industry, this study underscores the need to go beyond technical development and focus on organizational integration and industry-wide education. While blockchain is a technology-driven sector, its broader adoption depends heavily on how well firms adapt organizational structures and respond to market and regulatory environments. Industry leaders should prioritize cross-sector collaboration, regulatory alignment, and stakeholder awareness programs to foster a more conducive ecosystem for adoption. The non-significance of perceived usefulness and security suggests that trust in blockchain is already established in this industry; therefore, efforts should now shift toward scaling organizational readiness and increasing visibility and clarity about blockchain's real-world applications. Furthermore, since industry type (manufacturing, service, finance) was not a significant moderator, strategies for blockchain adoption may be designed with more universal frameworks, allowing firms across different sectors to adopt similar best practices. The industry must also continue to support research and development, while aligning efforts with educational and policy institutions to address organizational and environmental barriers to adoption.

Declarations

Ethics approval and consent to participate: The objectives, contents, and conclusion of this research were evaluated by a Research Ethics Board of a University and were found meritorious. No violations of research ethics standards were found, as the researchers were cautious and courteous in their data-gathering. There is no potential conflict of interest to declare. Informed consent was secured from the participating companies before data gathering.

Availability of data and materials : Research data is gathered through an online survey which is available upon request.

Competing interests : The authors declare that they have no competing interests

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