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Exploring the factors affecting the adoption of blockchain technology in the supply chain and logistic industry

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Background: The digitalisation phenomenon has significantly transformed and advanced the adoption of blockchain technology in organisations. The fourth industrial revolution has been the main driver of digital transformation in organisations to gain a competitive advantage in their respective industries. Therefore, studies on blockchain adoption have gained a relative pace over the recent years but there is limited literature focussing on the supply chain and logistics industry. The study fills the gap as it explored factors that affect the adoption of blockchain technology in supply chain and logistics.

Objectives: The primary research objective of the study was to explore the factors that affect the adoption of blockchain technology in supply chain and logistics. The study explored the technological, organisational, and environmental factors that affect the adoption of blockchain technology in the supply chain and logistics industry.

Method: The study conducted a content analysis of peer-reviewed articles published between 2013 and 2021 on the factors affecting the adoption of blockchain technology in the supply chain and logistics. The article used a quantitative study to explore factors affecting blockchain adoption using the Technology-Organisational-Environmental (TOE) framework as the theoretical lens.

Conclusion: In conclusion, the study revealed that Asia, Europe, and America contribute more research on factors affecting the adoption of blockchain technology between 2013 and 2021. In addition, the results suggest that technical factors (security, complexity, and cost), organisational factors (management support), and environmental factors (competition, IT policy and regulations, and support) affect the adoption of blockchain technology in supply chain and logistics industry. The study contributes to the body of knowledge on factors affecting the adoption of blockchain technology in the supply chain and logistic industry.

Keywords: digital transformation; blockchain technology; supply chain and logistics; blockchain adoption in organisations; TOE framework.

Introduction

We are living in a new age where rapid change is marked by the high rise of digital transformation. Most studies have shown that one of the biggest challenges that companies are currently faced with is integrating and using new technologies (Hess et al. 2016:123). Even big organisations are affected by the rapid change of digital transformation (Henriette, Feki & Boughzala 2016:2). Hess et al. (2016) said:

> The market-changing potential of new technologies is often wider than product, business process, logistics, business processes, supply channels, or supply chain in the entire business processes are reshaped and regularly overturned. (p. 2)

The third industrial revolution introduced computer-based systems and automation of processes in organisations. However, in this new age that we are living in, which is the era of fourth industrial revolution, the development of digital transformation is influencing every aspect of organisations.

The study adopted a quantitative content analysis to explore the factors that affect the adoption of blockchain technology in supply chain and logistics. The study seeks to explore factors that affect the adoption of blockchain technology in supply chain and logistics. The rest of the article is structured in the following order: a literature review of the area of study, the research

methodology of the study, the results of the study, and discussion and conclusion of the study.

Literature review

Overview of blockchain technology

Due to the rapid increase of emerging technologies, blockchain technology is one of the emerging technologies that has gained significant attention as a disruptive technology. Blockchain technology improves competitive advantages through innovative platform-based business models (Alazab et al. 2021:83). Different sectors such as governments, healthcare, agriculture, manufacturing, and supply chain have developed and tested the blockchain models. Blockchain technology is known as a technology that runs cryptocurrency; it is a public ledger system, which maintains the integrity of data (Saini et al. 2019). According to Yli-Huumo et al. (2016:5), blockchain technology was first introduced as the application platform that supports Bitcoin cryptocurrency. (Yli-Huumo et al. 2016:5). Murray (2019), defines:

> Blockchain technology as a decentralized ledger technology that provides a trusted and secure platform for digitally recording and securely storing verifiable and permanent transactions between multiple parties in the digitized networked world. (p. 465)

Therefore, the technology removes the need for costly intermediary validation and verification processes (Murray 2019:465). According to Weking et al. (2019:285), blockchain technology enables the supply chain and logistics industry to trace assets and settle transactions autonomously using a secure model that is resilient, fault-tolerant, and permanently available. In other words, blockchain technology allows all participants in a given system to have access equally to information about what went into producing and in the process of ordering a given product. Most studies have proven that although blockchain technology is considered a disruptive technology, it has the potential to tackle key business issues which include digital payment, contracts, and database and record management (Fosso Wamba et al. 2020:115).

Blockchain technology in supply chain and logistics

Previous studies suggest that there are higher expectations of blockchain improving supply chain operation, extending from product quality and productivity to other main process development (Alazab et al. 2021:85). Blockchain technology has enabled efficient recording, tracking, and sharing of information in organisations (Kamble, Gunasekaran & Arha 2019). In addition, blockchain technology has helped organisations to achieve a competitive advantage in the supply chain network. Alazab et al. (2021) said 'blockchain can reduce supply chain challenges and support various strategic objectives for supply chain management, such as reliability, quality, speed, risk mitigation, costs, growth, and agility'. The traceable capability of blockchain can help organisations get rid of fraud events and counterfeit goods. (Orji et al. 2020:6). Therefore, when considering the various challenges versus the benefits of adopting blockchain, organisations need to choose the correct service that will benefit their consumers, maximise possible benefits for the organisation while minimising the challenges they face.

Theoretical framework

The study adopted the Technology-Organisational-Environmental (TOE) framework as the theoretical lens to explore factors affecting the adoption of blockchain in supply chain and logistics. According to Tornatzky, Fleisher and Chakrabarti (1990), the TOE framework aims to identify three main factors that influence the adoption of IT innovations in organisations. These three factors describe both internal and external technologies that must be considered and relevant to the organisation (Oliveira & Martins 2011). Oliveira and Martins (2011) said:

> [*T*]he TOE framework has been used as an analytical tool to identify the factors that affect the adoption in organisations and has a solid theoretical base on technology adoption in organisations. (p. 11)

Technology factors

The technology factors of the TOE framework have been found useful to evaluate external and internal technologies that are available to the organisation (Ngah, Zainuddin & Thurasamy 2017). Kouhizadeh, Saberi and Sarkis (2021) said:

> [*T*]echnological factors incorporate technical capability, complexity, and the availability of innovation considered for adoption and blockchain technology is immature and this creates technical challenges, which include insufficient usability and scalability. (p. 6)

Another barrier to the adoption of blockchain technology within the supply chain and logistics can be the attribute of cost of deploying new technologies. The cost of deploying new technology is associated with the capital cost and installation of information technology (IT) whereas organisations are conservative about their capital spending (Ghobakhloo et al. 2012). According to Wong et al. (2020), blockchain technology requires new software and hardware, which is costly. However, relative advantage has a huge impact on the adoption of new technology for instance in the supply chain (Wong et al. 2020). Therefore, organisations that adopt blockchain technology can enjoy the advantage due to greater transparency and improved security in supply chain traceability (Wong et al. 2020). Therefore, organisations must consider technical complexity and its influence on individuals before adopting blockchain technology. Saberi et al. (2019) said 'data manipulation in supply chain networks can be a concern because adopting blockchain technology gives every participant of the supply chain network access to verify the transaction'. Lastly, privacy and data security are other factors that influence the adoption of blockchain technology. The security challenges include blockchain technology in

bitcoin networks such as hacks and cyber-attacks (Saberi et al. 2019).

Organisational factors

The organisational factors of the TOE framework, refer to the characteristics (i.e. industry, structure, culture and size) of the organisation (Ngah et al. 2017). According to Kouhizadeh et al. (2021), a lack of commitment from management creates a challenge because their support is essential when adopting blockchain technology. Wang, Chen and Xu (2016) states that the support of both top and lower management for the innovation adoption lies at the crux of vision on how the adoption of the innovation will have an impact on the organisation by securing additional resources, risk and dealing with change in the organisation.

Furthermore, another organisational factor that influences the adoption of blockchain in supply chain and logistics is organisational readiness. The factor refers to the availability of organisational resources to adopt new information technology innovation (Clohessy, Acton & Rogers 2019). Clohessy et al. (2019) said:

> [*M*]anagement of the organisation and the staff are likely to experience change, exhibit greater effort, and engage in cooperative behaviour when organisational readiness for a new IT innovation is high. (p. 16)

The firm size has also been identified to be an organisational factor that can influence the adoption of blockchain in supply chain and logistics. Wang et al. (2015) said:

> [*L*]arge organisations are currently more likely to adopt blockchain technology than small organisations, because they have more financial resources that support the adoption and mitigate any risks that involve the adoption of the innovation. (p. 3)

Clohessy et al. (2019) state that organisations willing to adopt a new innovative IT is influenced by the size of an organisation.

Environmental factors affecting the adoption of blockchain technology in supply chain and logistics

According to the TOE framework, environmental factor refers to the organisation's industry, its customers, and competitors that influence technology adoption (Ngah et al. 2017). The market dynamics refers to an environment that is complex and competitive in the state. However, the pressure of competitive advantage of blockchain technology adoption is a motivating factor to consider adopting the technology by organisations (Alshamaila, Papagiannidis & Li 2013). Wong et al. (2020), said:

> [*C*]ompetitive pressure refers to the organisation's internal pressure and the desire to gain a competitive advantage that influences organisations to adopt innovative technologies such as blockchain technology while facing the pressure of new development in the supply chain. (p. 4)

Moreover, it is most likely for a new organisation to adopt an innovation if the existing organisation decides not to adopt innovation that results in a competitive disadvantage (Wang et al. 2016). Furthermore, the blockchain technology that offers increased transparency and efficiency is likely to be adopted by supply chain and logistics organisations (Gökalp, Gökalp & Çoban 2020).

The policies and laws have a significant impact on the way the organisation perceives its data. Saberi et al. (2019) said:

> [*T*]he different privacy policies related to information and data usage may lead to challenges for the partners because of the transparency of information in blockchain technology information sharing rules and laws. (p. 9)

Wong et al. (2020), state that laws and regulatory policies have a significant role in promoting the adoption of blockchain technologies. Furthermore, another environmental factor that influences the adoption of blockchain in supply chain and logistics is inter-organisational trust. Schoorman, Mayer and Davis (2007), defines inter-organisational trust as:

> [*T*]he willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party. (p. 347)

Therefore, providing transparency and traceability improves the cooperation between the supply chain, network, and operation within the supply chain (Gökalp et al. 2020). Additionally, they also influence improving the level of trust in the supply chain network.

Research design and methodology

Research design

The research design used in the study to address the stated research question and its objective was a systematic literature review with the design of quantitative content analysis. A systematic literature review provides a researcher with a pre-defined literacy tool, which gives the researcher to identify reliable evidence (Gupta et al. 2018). Mouton (2001) said, 'content analysis is useful to analyse the content of text or documents such as letters, speeches, and annual reports'. Moreover, when the design is content analysis, it consists of an empirical textual analysis of secondary data with a low level of control (Mouton 2001). Babbie and Muoton (2001) said 'the content analysis research methodology is flexible because it can be of both quantitative content analysis and qualitative content analysis'. The study adopted the quantitative content analysis. Content analysis is used for exploratory studies (Nueman 2006:49).

Unit(s) of analysis

According to Babbie and Mouton (2001:84), the unit of analysis refers to what you are interested in research from the study. In the research study, organisations are the selected unit of analysis type. The characteristics of the organisations are size, structure, location, and aggregated descriptions of their members (Babbie & Mouton 2001). The selected unit of analysis (UOA) is organisations within the supply chain and

logistics industry. The study explored the factors affecting the adoption of blockchain technology in supply chain and logistics. The primary research objective of the study was to explore the factors that affect the adoption of blockchain technology in the supply chain and logistic industry.

Design of the research instrument

The study used keywords to conduct a literature search such as 'Blockchain Adoption', 'Digital Transformation', 'Blockchain technology', 'Supply chain and Logistics', 'Blockchain adoption in organisations', 'TOE framework'. The study included all articles published between 2013 and 2021, and 50 articles were selected. The valid articles were manually coded and categorised as per Table 1 in preparation for the quantitative data analysis after capturing an Excel spreadsheet. The coded data were subjected to statistical analysis using SPSS statistical to produce frequencies, analysis of variance (ANOVA), and correlations of TOE factors as provided in Table 1.

Data sources, sampling strategies, and techniques

The sampling method used for the research study is convenience sampling. The convenience sampling involved the search and selection of relevant peer-reviewed articles from accessible databases. Convenience sampling as a non-probability type of sampling selects members of the population that meet certain criteria (availability of time, easy accessibility, geographical proximity) that are included in the study to meet its purpose (Etikan, Musa & Alkassim 2016). The convenience sampling involved searching for keywords from the databases that were published between 2013 and 2021. The keywords used include 'Blockchain Adoption', 'Digital Transformation', 'Blockchain technology', 'Supply chain and Logistics', 'Blockchain adoption in organisations', 'TOE framework'. The selected published peer-reviewed articles from the databases were published between 2013 and 2021.

Research methods

The research method for the study that is to address the stated research question and its objectives will be a systematic literature review. As per Mouton (2001:179), the literature review is 'Studies that provide an overview of scholarship in a certain discipline through an analysis of trends and debates', and is a non-empirical study, which makes use of secondary data. The study data collection method was primarily qualitative and based on convenience sampling of peer-reviewed articles using relevant keywords to search in selected databases, namely, AIS library, Science Direct, and Taylor Francis Online. According to Gupta et al. (2018), 'Systematic reviews employ a pre-defined protocol to identify relevant and trustworthy literature'. The steps used to conduct a systematic literature review included research question development, research question quality evaluation, exclusion and inclusion criteria, study protocol development, registering the review, selecting databases, conducting study research, evaluating the quality of search, filtering studies, data extraction, assessing studies bias, data analysis, and synthesis, interpretation and reporting result (Gupta et al. 2018).

TABLE 1: Technology-organisational-environmental factors that influence blockchain adoption.

Technology factors	Organisational factors	Environmental factors
Compatibility	Management competency	Market structure
Complexity	Technical skills	Competition
Relative advantage	Firm size	Managerial support
Perceived usefulness	Resource capacity	Vendor capabilities
Cost	Organisational readiness	Political dominance
Security	Strategic objectives	Information technology (IT) policy & regulations

Data analysis

Data analysis constituted categorising and counting the existence of pre-defined contexts in the selected group of published articles. The 50 selected articles were manually coded by the researcher based upon subjective interpretation whereby the researcher identified similarities in the qualitative data and subsequently, categorised the qualitative data into sections sharing similar content based upon factors that influence blockchain technology adoption. Krippendorff (2004) said, 'reliability testing is the degree to which an assessment tool produces stable and consistent results'. Inter-coder reliability refers to a measure in which independent judges make the same coding decision (Lombard, Snyder-Duch & Bracken 2002). Therefore, the qualitative data was converted and coded into quantitative data. The quantitative data was analysed using SPSS (statistical analysis tool) to produce frequency, ANOVA, and correlation statistical results.

Research results

This section presents results from the study on factors affecting the adoption of blockchain technology in the supply chain and logistics based on published articles between 2013 and 2021. The rest of the section is structured as follows: the demographic frequency, the frequency of the TOE factors, and the ANOVA of TOE variables and demographic variables.

Demographic data frequency

Article by year

Figure 1 presents the frequency of published articles between 2013 and 2021 on factors affecting the adoption of blockchain technology in the supply chain and logistics industry. The results indicate that 22% of related articles were published between 2013 and 2018 whereas 78% of related articles were posted later between 2019 and 2021. These results suggest that there had been an increase in research output in general from the period under review. The years 2013 and 2017 had the lowest research output at 2% each compared with 2020 which had the highest research output at 42%.

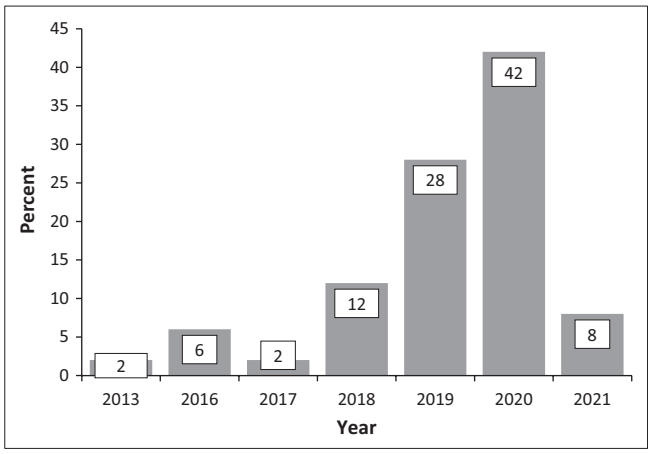

FIGURE 1: Articles by year.

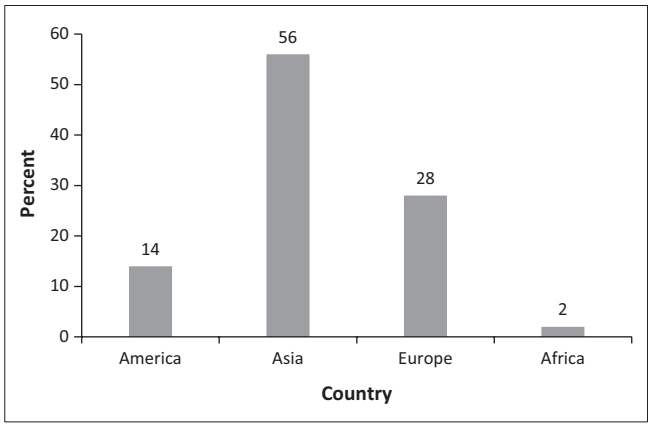

FIGURE 2: Articles by region.

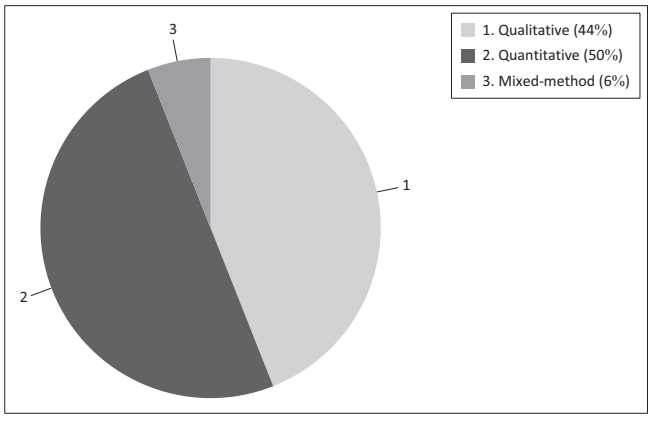

FIGURE 3: Articles by research method.

Articles by region

Figure 2 presents the frequency of published articles by region between 2013 and 2021 on factors affecting the adoption of blockchain technology in the supply chain and logistics industry. The results show that 56% of published articles were from Asia, Europe at 28%, America at 14%, and Africa at 2%, the lowest number of articles published on factors that affect the adoption of blockchain technology in the supply chain and logistics industry. The results show that Asia accounts for more than half of the published articles on factors affecting the adoption of blockchain technology in the supply chain and logistics industry between 2013 and 2021.

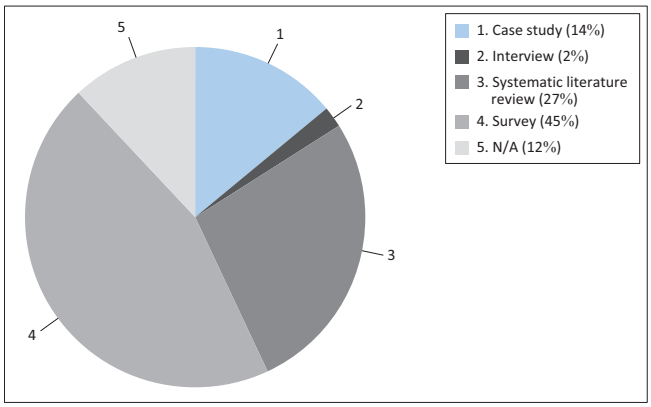

FIGURE 4: Articles by research design.

Articles by research method

Figure 3 presents the frequency of the research methods used in published articles between 2013 and 2021 on the factors affecting the adoption of blockchain technology in the supply chain and logistics industry. The results show that quantitative research at 50% was the most used research method, the second most use was qualitative research at 44%, and mixed-methods research was the least used at 6% of published articles between 2013 and 2021. The results suggest that quantitative research studies were the most used research method when conducting research on factors affecting the adoption of blockchain technology in the supply chain and logistics industry between 2013 and 2021.

Articles by research design

Figure 4 presents the frequency of the research types used in published articles between 2013 and 2021 on factors affecting the adoption of blockchain technology in supply chain and logistics. The results show that most articles published between 2013 and 2021 were surveys at 45%, followed by systematic literature review at 27%, and case studies placing third at 14%. Furthermore, the results suggest that interviews were the lowest used type of research as only 2% of published articles between 2013 and 2021 used the method on factors affecting the adoption of blockchain in the supply chain and logistics industry.

Articles by framework

Figure 5 presents the frequency of the research frameworks used in articles published between 2013 and 2021 on factors that affect the adoption of blockchain technology in supply chain and logistics. The frameworks include the Technology Acceptance Model (TAM), the Diffusion of Innovation Theory (DOI), the Technology-Organisation-Environment framework (TOE), and Unified theory of acceptance and use of technology (UTAUT). The results indicate that most articles, at 48%, did not use a framework (NA). Furthermore, the results suggest that the TOE framework was the most used research framework at 28%, followed by UTAUT at 14% and TAM at 8%. Lastly, the results suggest that the DOI framework at 2% was the least used framework of published

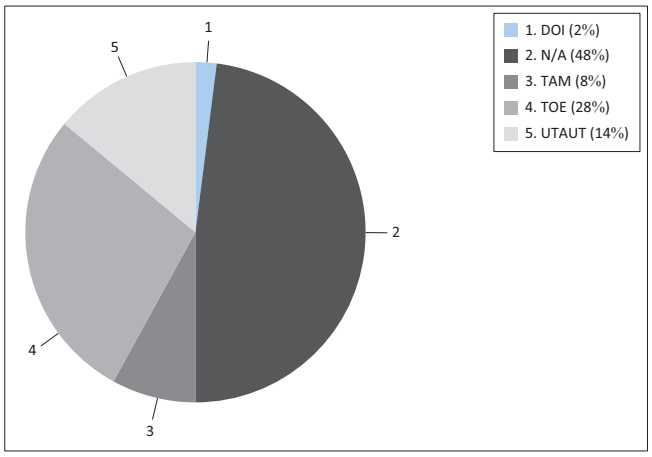

FIGURE 5: Articles by the framework.

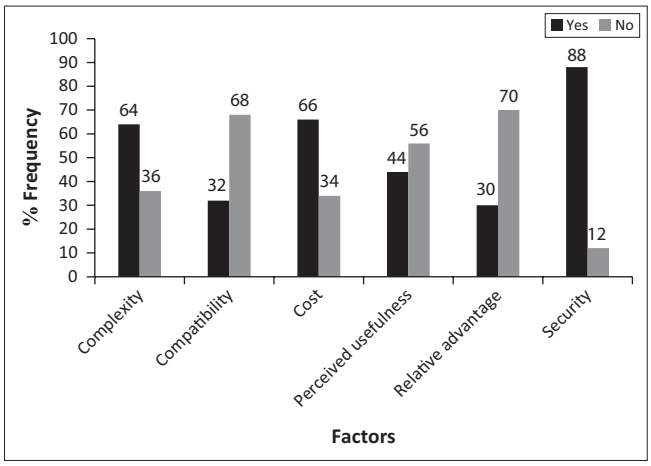

FIGURE 6: Frequency of technology factors.

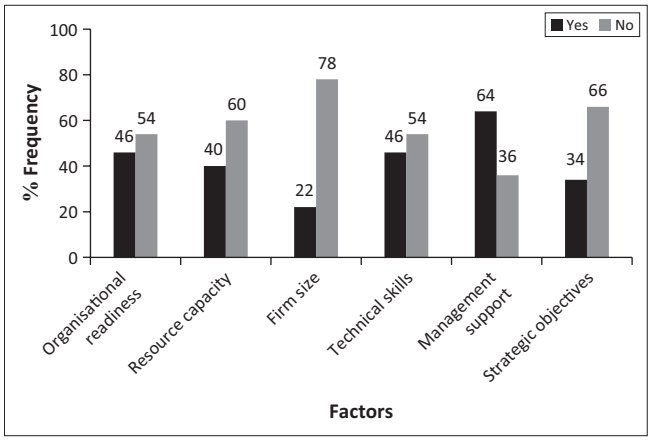

FIGURE 7: Frequency of organisational factors.

articles between 2013 and 2021 on factors affecting the adoption of blockchain technology in the supply chain and logistics industry.

Frequency results of technology-organisational-environmental factors

This section presents the results of the technology, organisational and environmental factors that affect the adoption of blockchain technology in supply chain and logistics.

Technology factors

The study analysed six technology factors that affect the adoption of blockchain technology in supply chain and logistics which include relative advantage, complexity, perceived usefulness, compatibility, security, and cost. Figure 6 presents the frequency results of technology factors that affect the adoption of blockchain technology in supply chain and logistics based on 50 peer-reviewed published articles. The results indicate that security was considered the most important technical factor that affect the adoption of blockchain technology in supply chain and logistics with 88%, followed by cost at 66% and complexity at 64%.

This result suggests that organisations should be financially stable while ensuring high security when adopting blockchain technology. The results are supported by Lin (2014) and Orji et al. (2020) who all stated that the costs involved in the adoption of blockchain technology are important in decision making. These costs include procuring the equipment and maintaining blockchain technology in supply chain and logistics. Furthermore, 44% of articles discussed perceived usefulness as an influencing factor, followed by compatibility at 32%. Finally, the relative advantage was the least discussed factor as it was only cited in 30% of the articles. Therefore, these results suggest that organisations should consider compatibility and relative advantage as the least factors when deciding to adopt blockchain technology in supply chain and logistics.

Organisational factors

The study analysed six organisational factors that affect the adoption of blockchain technology in supply chain and logistics, which include firm size, management support, organisational readiness, resource capacity, technical skills, and strategic objectives. Figure 7 shows the results of the organisational factors from published articles between 2013 and 2021. The results show that 64% of articles discussed management support as an influencing factor, followed by organisational readiness and technical skills on both 46% and then resource capacity at 40%.

These results suggest that because blockchain technology requires certain training and knowledge to use the technology in the organisation, the supply chain and logistics industry should consider technical skills when adopting blockchain technology. In addition, organisations should consider top management support as they serve the purpose of ensuring that blockchain technology is effectively adopted by taking part in the adoption process. The results are supported by Orji et al. (2020), who stated that the top management team serves as an organisation interface to stakeholders and supports organisational decision outcomes. Furthermore, 34% of articles discussed strategic objectives as an influencing factor, and finally, firm size was the least discussed factor that affect the adoption of blockchain technology in supply

chain and logistics as it was only cited in 22% of the articles. The result suggests that the supply chain and logistic industry should consider firm size as the least factor when adopting blockchain technology as this may decrease the organisations' competitive advantage.

Environmental factors

The study measured six environmental factors that affect the adoption of blockchain technology in supply chain and logistics which include vendor capabilities, regulation/IT policy, competition, market structure, government pressure, and support/maintenance. Figure 8 presents frequency results of environmental factors based on the peer-reviewed articles published between 2013 and 2021. The results indicate that competition had 72% of the peer-reviewed articles, regulations, and IT policy at 54%, and lastly support and maintenance at 50%.

The results suggest that organisations are motivated by competitive pressure, IT policy and regulation, and maintenance support to adopt blockchain technology in the supply chain and logistic industry. Orji et al. (2020) support the study result by stating that organisations adopt blockchain technology to be on par with other organisations and attract more customers while making profits. Furthermore, 40% of articles discussed government pressure as an influencing factor, followed by market structure at 22%. Finally, vendor capability was the least discussed factor that affects the adoption of blockchain technology in supply chain and logistics with only 12% cited articles. The result suggests that supply chain and logistic industries should consider vendor capability as the least factor when adopting blockchain technology as it has less influence.

Analysis of variance

As shown in Table 2, the ANOVA analysis of the variable year and the technology factors (relative advantage and security) indicate significant differences below 0.05, that is, relative advantage at 0.013, security at 0.028, and total technological factors at 0.008. The results suggest that there are significant differences between technology factors (relative advantage, security, and total technological factors) and the demographic variable year. The results show that the technology factors such as relative advantage, security, and total technological factors were the only variables that showed significant differences when measured against the year variable. In summary, there were significant differences in the occurrence of the three variables under the years under review.

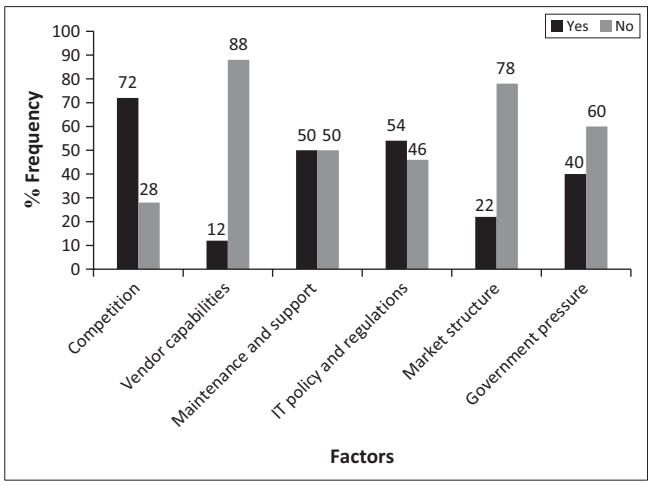

FIGURE 8: Frequency of environmental factors.

Technology-organisational-environmental factors correlations

This section discusses the variation of the importance of technology, organisation and environmental factors across various demographic variables inclusive of the year published, research method, research type, research framework, and region of study. Correlation analysis was conducted to identify factors with significant influence on the adoption of blockchain in supply chain and logistics.

Table 3 depicts the correlation between TOE factors (technology, organisational and environmental) and the year the article was published. Correlation is significant at 0.05 and 0.01. Technology and environmental factors share a Pearson correlation of 0.481 (positive value) which is close to 0 than 1, thus indicating a positive but weak relationship or correlation between technology and environmental factors over time. Moreover, the two Sig. (2 tailed) value 0.080 and 0.842 of technology and environmental factors are relatively large, that is, greater than 0.05, thereby indicating that the correlation is not significant. Finally, the technology, organisational and environmental factors share the same Sig (2-tailed) value of 0.000, which is less than 0.01 and is therefore significant at the 0.01 level. Thus, we can conclude that there is a statistically significant correlation between technology, organisational and environmental factors.

Discussion and conclusions

The study conducted a systematic literature review on factors that affect the adoption of blockchain technology in supply chain and logistics, focusing on articles published between 2013 and 2021. The study reviewed 50 peer-reviewed articles to provide an in-depth holistic view of blockchain adoption in the supply chain and logistic industry. The study used the

TABLE 2: Analysis of variance technology factors by year.

Variables	Sum of squares	df	Mean square	*F*	Sig.
Relative advantage					
Between groups within Groups total	3.17	6	0.53	3.09	0.013
	7.33	43	0.17	-	-
	10.50	49		-	-
Security					
Between groups within groups total	1.42	6	0.24	2.64	0.028
	3.86	43	0.09	-	-
	5.28	49	-	-	-
Total technology factors					
Between groups within groups total	25.95	6	4.33	3.37	0.008
	55.17	43	1.28	-	-
	81.12	49	-	-	-

TABLE 3: Correlation of technology-organisational-environmental factors.

Varible	Articles by year	Total technology factors	Total organisational factor	Total environmental factors
Articles by year				
Pearson correlation	1000	0.250	0.059	-0.029
Sig. (2 tailed)	-	0.080	0.684	0.842
N	50	50	50	50
Total technology factors				
Pearson correlation	0.250	1000	0.555	0.481
Sig. (2 tailed)	0.080	-	0.000	0.000
N	50	50	50	50
Total organisational factors				
Pearson correlation	0.059	0.555	1000	0.623
Sig. (2 tailed)	0.684	0.000	-	0.000
N	50	50	50	50
Total environmental factors				
Pearson correlation	-0.029	0.481	0.623	1000
Sig. (2 tailed)	0.842	0.000	0.000	-
N	50	50	50	50

TOE framework to explore the factors that affect the adoption of blockchain technology in supply chain and logistics. The study results revealed that security, complexity, and cost are the major technological factors influencing the adoption of blockchain technology in the supply chain and logistics industry. The results support literature that states that for smooth adoption of blockchain technology in the supply chain, it requires substantial administrative and implementation costs (Lin 2014). Therefore, the results suggest that the supply chain and logistics industry are most likely to adopt blockchain technology if it benefits the organisation while being cost-effective and ensuring high security within the supply chain and logistics industry.

The study results revealed that organisational readiness and technical skills are the major organisational factors influencing the adoption of blockchain in the supply chain and logistics industry. In addition, the study results revealed that environmental factors such as competition, IT policy and regulations, and support affect the adoption of blockchain technology in the supply chain and logistics industry. Therefore, the results suggest that technical factors (security, complexity, and cost), organisational factors (management support), and environmental factors (competition, IT policy and regulations, and support) affect the adoption of blockchain technology in supply chain and logistics industry.

Furthermore, the ANOVA revealed a significant difference between a year and three technological factors (relative advantage, security, and total technology variables). The results, therefore, suggest the occurrence of relative and security differed in the period under review on factors that affect the adoption of blockchain technology. The correlation analysis revealed was a significant positive relationship among the three TOE factors. The correlation analysis results suggest that if one construct increases, the other two constructs also increase which they all support each other.

In conclusion, the study results suggest that technical factors (security, complexity, and cost), organisational factors (management support), and environmental factors (competition, IT policy and regulations, and support) affect the adoption of blockchain technology in supply chain and logistics industry. The study contributes to the body of knowledge on factors affecting the adoption of blockchain technology in the supply chain and logistic industry. Despite its contribution, the study has its limitation and weaknesses because it was not based on empirical data and not random sampling. The study results therefore cannot be representative of the supply chain and logistics industry. The limitation of the study can provide an opportunity for further studies based on empirical data and other research methodology. However, in summary, the study achieved its objective to explore the factors that affect the adoption of blockchain technology in supply chain and logistics.

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Competing interests

The authors have declared that no competing interest exists.

Authors' contributions

A.M. was the main author with Prof. Jokonya acting as supervisor.

Ethical considerations

This article followed all ethical standards for a research without direct contact with human or animal subjects.

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Data availability

Data sharing is available upon reasonable request from the corresponding author (O.J.).

Disclaimer

The views and opinions expressed in this article are those of the authors.

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