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LEVERAGING THE POTENTIAL OF BLOCKCHAIN TECHNOLOGY TO PROMOTE TRACEABILITY OF SMES ACTIVITIES IN KENYA

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Abstract: Blockchain technology presents unique opportunities as regards its traceability capabilities. This paper explored the critical success factors for adopting blockchain technology to promote traceability in the supply chain of SMEs. To achieve this, a qualitative thematic analysis of scholarly articles pertaining to blockchain-based traceability systems was conducted. The researcher used Google Scholar to identify and select 28 scholarly articles. Inclusion-exclusion criteria for this systematic review include: the article must be empirical; the study focused on the blockchain technology and traceability; the study targeted supply chains, and was published in the last 7 years. The results were presented by addressing the needs of various stakeholders including consumers, regulators, and suppliers. The critical success factors for implementing blockchain technology included technology readiness level, supply chain practices, regulation of traceability efforts, and collaborative participation. These findings play a crucial role in providing researchers and practitioners allied to the SME sector with a basis for further descriptive and empirical research in implementing blockchain technology for traceability purposes.

Keywords: Blockchain Technology, Traceability Systems, Supply Chain, Critical Success Factors

Introduction

Small and medium-sized enterprises (SMEs) are defined differently in various contexts. However, the bottom line is that these businesses are renowned for their immense contribution to the economic development of most African countries including Kenya (Douglas et al., 2017). In Kenya, small-sized enterprises are defined as businesses with 10-49 employees, and medium-sized enterprises are categorised as businesses with 50-99 employees (Chege & Wang, 2021). In the fast-paced modern-day business world, SMEs are still playing catch up since they are yet to upgrade their traditional business practices to compete with established multinational corporations, which have fully embraced technology (Hervas-Oliver et al., 2021).

A number of researchers have carried out studies to establish reasons why SMEs are yet to embrace blockchain technology (BCT) in the 21st century: First, unlike blockchain technologies, SMEs transactions are not only centralised, but also they are also backed up using third-party software (Bracci et al., 2021). Second, cryptocurrency payments is a new technology that will

potentially disrupt the traditional way of SME operations (Nuryyev et al., 2020). Third, since their inception, most SMEs have their information haphazardly dispersed, such as bills, maintenance requirements, and transaction histories (Rakshit et al., 2021). Fourth, SME owners associate blockchain technology with complexity and cost concerns. The International Finance Corporation (IFC) estimates that 90% of businesses in various parts of the world are SMEs, which create more than half of the existing jobs (Alibhai et al, 2017). In developing countries, SMEs are renowned for enhancing productivity of their respective economies as well as the alleviation of poverty. In order to achieve a level playing field with other established multinational corporations, SMEs in Kenya must find innovative ways of boosting their performance, improving their product/service quality, and adopting sustainable business practices (Mutiso & Maguru, 2020).

Embracing BCT is one of the most viable ways of helping SMEs reach such milestones especially by ensuring the traceability of their assets and operations. BCT is an innovative technology renowned for high traceability, transparency, confidentiality, irreversibility, accuracy, and delivery (Agung, 2022). When it comes to traceability, BCT leverages the use of smart contracts to ensure that every user can track the history of trusteeship and journey of an asset in real-time. As defined by the United Nations Global Compact, “Traceability is the ability to identify and trace the history, distribution, location and application of products, parts and materials, to ensure the reliability of sustainability claims, in the areas of human rights, labour (including health and safety), the environment and anti-corruption” (UNGC, 2014). Even with this favourable opportunity for SMEs to adopt BCT (Jin and Hurd, 2018), existing research is yet to show the extent to which blockchain technology has the potential to promote traceability of SMEs activities in Kenya. Since SMEs lack traceability of their activities, Mutamimah et al. (2022) argue that it is both a social and an economic challenge, which calls for the implementation of a traceability systems that can provide transparency in their operations.

Traceability has been acknowledged as an effective tool for achieving sustainability objectives in a number of businesses. This is caused by the constantly increasing demand from consumers for responsibly sourced and produced products together with the obligations by regulatory framework to improve transparency and tracking in supply chains (Agrawal et al., 2021). Even though other sectors, industries, countries, and regions have already started implementing traceability, SMEs are yet to tap into it despite their massive numbers and assimilation in the global economy. The traceability system of BCT also facilitates the detection of fraud and secures the integrity of the supply chain globally (Ahmed & MacCarthy, 2021; Hastig & Sodhi, 2020). Currently, the SME market is still vastly unregulated, but the effective traceability protocols of BCT could play a key role in preventing the entry of illegal products in the supply chains of the small businesses (Whiteley, 2020; Angeloska et al., 2020). Blockchain-based traceability systems can be instrumental in helping SMEs in Kenyan to abide by regulations and to record the history of ownership transfer of assets (Rakshit et al., 2022). As such, owners and managers of SMEs bear the task of scrutinising the (1) scalability and infrastructural aspects of BCT’S traceability system; (2) application of confidential and uniform data collection practices in the supply chain, and (3) regulatory compliance for customer privacy and security (Hastig & Sodhi, 2020; Nuryyev et al., 2020; Whiteley, 2020).

Despite the fact that the majority of SMEs in Kenya are geographically concentrated in the industrial areas of the two biggest cities in the country: Nairobi and Mombasa, their potential to contribute to technological innovations and industrial development is yet to be empirically explored thoroughly. As such, in the context of BCT, this study seeks to understand the traceability of SMEs activities in Kenya based on existing IT-based systems. Even though other

firms as well as various IT vendors have proposed different technologies for traceability, this study will narrow its focus on BCT. The agricultural sector has already proposed a number of blockchain-based solutions to livestock data management (Muganda et al., 2020) along with food traceability and safety (Lesiit, 2020). However, the studies have mainly focused on BCT for traceability without exploring transparency solutions in the business context that can sustainably complement the proposed traceability systems. As such, this paper mainly delves into the how SMEs can implement BCT-based traceability in their business context by identifying and exploring key factors that are crucial to the effective application of the systems in the supply chain.

BCT comes with key benefits including potential operational cost savings that SMEs could realise. However, some regulations could indirectly thwart the implementation of BCT to promote traceability of SMEs activities because the sector lacks standalone laws (Mutiso & Maguru, 2020). Certainly, the lack of a robust regulatory framework stands out as one of the reasons why the sector lacks government support in terms of the provision of loans, grants, and collateral, along with the use of ICT to improve productivity (Douglas et al., 2017). This means that the successful adoption of blockchain-based traceability systems could be uncertain partly due to lack of regulation. Therefore, SME owners who are pursuing operational effectiveness should come up with viable ways of linking their supply chains with viable IT-based infrastructure that can support the development of blockchain technologies (Chege & Wang, 2021; Osano, 2019). Even so, the extent to which the implementation of BCT to achieve traceability of SME activities will still be highly influenced by government regulations. Therefore, the small businesses need guiding principles to curtail illegal practices associated with the manipulation of data because traceability methods may not adhere to similar standards across the supply chain.

Methods

Having explored the critical success factors crucial to the effective application of BCT, there's need to research on more information from existing literature that will contribute to the implementation of BCT to promote traceability of SME activities in the supply chain. This study gathered information that will complement and supplement the development of BCT models for traceability purposes. Exploring the measurement models that other researchers have put forward would provide stakeholders and practitioners in the SME sector with a basis for conducting blockchain-based empirical research as well as the requisite instruments for carrying out further descriptive and normative research on traceability in SMEs' supply-chain.

To achieve this, a qualitative thematic analysis of literature pertaining to blockchain-based traceability systems was conducted. Castleberry & Nolen (2018) defines thematic analysis as a qualitative research method whereby the researcher thoroughly analyses a set of text with the purpose of identifying, defining, organising, and producing common ideas, subjects and patterns that repeatedly come up. The process necessitates a well organised and systematic analysis approach by the researcher in such a way that it is flexible enough to assess a detailed account of data, and interpreting the findings sensibly (Vaismoradi et al., 2016; Sundler et al., 2019). In the context of this study, data refers to a carefully selected sample of 'relevant' articles that were vital for the enquiry. As presented by Sodhi and Tang (2014), a mature research stream has four stages: (1) awareness, (2) framing, (3) modelling, and (4) validation. This study employed all these stages in the thematic analysis.

With reference to Sodhi and Tang (2018), the thematic analysis was conducted in six steps and the studies included are presented in Table 1. The steps include: (1) familiarization with the

corpus of 'data'; (2) coming up with preliminary data codes; (3) searching for key themes; (4) conducting a thorough review of the identified themes; (5) naming and describing the identified themes; and (6) generating the final report. The first step - familiarization with the corpus of 'data' involved the sampling of blockchain-based literature. The second, third, and fourth steps were sequential as regards identifying codes, themes, and sieving out data with the aim of reaching an informed decision on the 'relevance level' of various themes or sub-themes. The initial themes that were extracted were generalised to all industries using a three-level hierarchy: theme, sub-theme, and codes. This provided a basis for the fifth step, which entailed the naming and description of the identified themes, along with their concepts.

This study's data corpus focused on coming up with a comprehensive sample of blockchain-based literature on traceability in SMEs' supply chain. The researcher used Google Scholar because of its plethora of articles, in addition to its filtering feature per the publication period. The listing of the articles enabled the researcher to sift out articles related to the research as of July 2022. Google Scholar's proprietary algorithm ranks each article based on the author; the journal publication; and most importantly, the frequency at which the articles have been cited by other scholars (Martín-Martín et al., 2018). The search was conducted by entering the keywords 'blockchain', 'supply chain', 'traceability', and 'SMEs' or 'small and medium enterprises' in the search box. Google Scholar's proprietary algorithm ranked these articles according to their importance. The study prioritised the selection of articles that were ranked higher by the search engine.

The relevance of the articles was systematically assessed by going through their entire texts from the abstracts to the references/appendices. All articles with content that were off-topic were discarded. It is also important to mention that articles that were ranked too low did not show up in the search because they had not been cited much. Another limitation worth mentioning is that information on blockchain and traceability was still novel as of 2022 and this means that some relevant articles further down the list may have been missed. Despite the limitations, the methodology uncovered the relevant themes on critical success factors of BCTs traceability. The study used an across-the-board corpus that included journals from multiple blockchain-based sources to ensure that the list of themes and codes were exhaustive. Inclusion-exclusion criteria for this systematic review include: the article must be empirical; the study focused on the blockchain technology and traceability; the study targeted supply chains, and was published in the last 7 years. Finally, a total of 28 journal articles were selected as shown in Table 1.

Table 1: Sources from Google Scholar Selected for Thematic Analysis

#	Reference	#	Reference
1	Mirabelli, G., & Solina, V. (2020)	15	Hader, M., Tchoffa, D., El Mhamedi, A., Ghodous, P., Dolgui, A., & Abouabdellah, A. (2022).
2	Dasaklis, T. K., Voutsinas, T. G., Tsoulfas, G. T., & Casino, F. (2022)	16	Ahmed, W. A., & MacCarthy, B. L. (2021).
3	Hastig, G. M., & Sodhi, M. S. (2020).	17	Baralla, G., Pinna, A., & Corrias, G. (2019)
4	Agrawal, T. K., Kumar, V., Pal, R., Wang, L., & Chen, Y. (2021)	18	Cocco, L., Mannaro, K., Tonelli, R., Mariani, L., Lodi, M. B., Melis, A., & Fanti, A. (2021).
5	Wang, Z., Wang, T., Hu, H., Gong, J., Ren, X., & Xiao, Q. (2020)	19	Wong, L. W., Leong, L. Y., Hew, J. J., Tan, G. W. H., & Ooi, K. B. (2020).

6	Casino, F., Kanakaris, V., Dasaklis, T. K., Moschuris, S., Stachtiaris, S., Pagoni, M., & Rachaniotis, N. P. (2021)	20	Nayak, G., & Dhaigude, A. S. (2019).
7	Westerkamp, M., Victor, F., & Küpper, A. (2018)	21	Chern, B. T. P., & Aun, T. B. (2021)
8	Bischoff, O., & Seuring, S. (2021).	22	Chen, J., Chen, S., Liu, Q., & Shen, M. I. (2021).
9	Omar, I. A., Debe, M., Jayaraman, R., Salah, K., Omar, M., & Arshad, J. (2022)	23	Ruzza, D., Morandini, L., & Chelli, A. (2022).
10	Casino, F., Kanakaris, V., Dasaklis, T. K., Moschuris, S., & Rachaniotis, N. P. (2019)	24	Kaur, J., Kumar, S., Narkhede, B. E., Dabić, M., Rathore, A. P. S., & Joshi, R. (2022).
11	Dasaklis, T. K., Casino, F., & Patsakis, C. (2019)	25	Testi, N. A. (2022).
12	Huang, H., Zhou, X., & Liu, J. (2019)	26	Tsang, Y. P., Choy, K. L., Wu, C. H., Ho, G. T. S., & Lam, H. Y. (2019).
13	Mann, S., Potdar, V., Gajavilli, R. S., & Chandan, A. (2018).	27	Sunny, J., Undralla, N., & Pillai, V. M. (2020)
14	Rejeb, A. (2018)	28	Petersen, M., Hackius, N., & von See, B. (2018).

Results

The following themes and sub-themes were developed after exploring the critical success factors for implementing BCT to promote traceability in various focal companies and industries.

4.1 Technology Readiness Level

Technology readiness is the inclination of an individual or a business to adopt and implement new technologies in order to accomplish specific goals, in this case, traceability of SME activities (Blut & Wang, 2020. Rybicka et al. (2016) defines technology readiness level (TRL) as a measurement system that evaluates the maturity level of various components of a particular technology, in this case BCT. Three subthemes were identified for this critical success factor: (a) technology maturity, (b) technology practicability, and (c) data security. One of the key limitations of BCT is that the speed of recording transactions is dictated by the number of nodes (Chen et al., 2021).

While the implementation of BCT comes with a lucrative cost-benefit analysis, it is important for SMEs to assess its practicability in the sector (Mann et al., 2018; Casino et al., 2019; Casino et al., 2021). Rather than promoting traceability of their activities using BCT, the SMEs could go for other alternatives that will not deplete their already meagre resources (Rejeb, 2018). As such, although BCT is attractive, many small businesses and start-ups are yet to channel their resources to explore its potential (Petersen et al., 2018). SMEs have not fully embraced BCT, as only a handful have adopted and implemented it, with only a few currently using it for traceability purposes (Nuryyev et al., 2020; Sunny et al., 2020; Ruzza et al, 2022) as of this writing.

4.2 Supply Chain Practices

Two subthemes were identified for this critical success factor. A common starting point for assessing supply chain practices is its (a) operations model, (b) information gathering tendencies. To successfully adopt, implement, and use traceability systems across the supply chain, businesses should promptly collect, store, and process standardized data (Baralla et al., 2019; Ahmed & MacCarthy, 2021; Bischoff & Seuring, 2021). However, many studies show that across the supply chain of various industries that have implemented BCT, businesses are yet to achieve standard data collection practices for traceability purposes. In addition, when it comes to sharing information among various parties, the business use different data structures (Hader et al, 2022).

The lack of a standardized way of information gathering and sharing results from the use of different models when trying to implement traceability systems. Establishing best practices is one of the most viable solutions to standardizing various practices in the supply chain (Ahmed & MacCarthy, 2021; Bischoff & Seuring, 2021). However, this can only be achieved if companies find practical ways of sharing their best practices after accessing the IT infrastructure of their suppliers (Li et al., 2020; Kaur et al., 2022; Testi, 2022). The biggest challenge would be the unwillingness of suppliers to share such information.

4.3 Regulation of Traceability Efforts

Two subthemes were identified for this critical success factor: (a) operating within a legal framework, and (b) administering information supervision. Petersen et al. (2018) surveyed 155 industry professionals in the supply chain to examine their expectations from BCT and found that the biggest obstacle to its adoption is 'regulatory uncertainty.' For SMEs to successfully achieve traceability of their activities, it is important that their supply chains abide by strategically enacted laws and regulations surrounding data governance (Dasaklis et al., 2018; Westerkamp et al., 2018; Hastig & Sodhi, 2020). As of this writing, it is evident that existing laws and regulations are inadequate in regulating cryptographic activities, which calls for a thorough systematic review of the current legal framework (Demestichas et al. 2020).

4.4 Collaborative Participation

Three subthemes were identified for this critical success factor: (a) Trust among business partners; (b) aligning traceability objectives with partners; and (c) stakeholder acquisitions. To ensure that BCT successfully works in a complex supply chain, collaboration is compulsory (Nayak et al., 2019; Agrawal et al., 2021). Mirabelli & Solina (2020) puts this into perspective by arguing that some business partner can be a threat in the supply chain if they are sceptical to adopt traceability solutions. This is more risky when upstream players are the ones opposing the adoption, and this could happen when they feel that their competitive advantage is under threat (Agung, 2022).

Furthermore, supply chain partners that tolerate unauthorized business practices can also resist any collaborations towards achieving traceability. Therefore, when pursuing the support of various partners in the supply chain, it is crucial for SMEs to prioritize their objectives as regards the traceability of their activities. As such, agreeing with supply chain partners on the parameters that govern the recording of goods at every aggregation node is crucial (Wong et al., 2018).

Discussion

According to the findings, BCT is the only available and most effective technology for implementing traceability globally. While some companies have tried using web-based technology to provide provenance-related transparency to the public, regulators, and their consumers (Sodhi and Tang, 2019), most of their supply chains are controlled by the original equipment manufacturers (OEM). These companies have been successful only to some extent because provenance is a selling point. When it comes to blockchain-related traceability, the technology is not only influenced by the characteristics of the supply chain, but also changes in the critical success factors, especially where BCT is not in use (Westerkamp et al., 2018).

From the findings, to improve traceability of SMEs activities, it is important to exhaustively outline key practices from blockchain or any other technology deemed feasible (Testi, 2022). In cases the technology turns out to be too risky or impracticable, the companies should find alternative ways of developing traceability practices without it. As stated by Mutamimah et al. (2022), changes in business processes account for more than 80% of implementation efforts of BCT, with less than 20% of the effort attributed to the actual implementation process. This suggests that SMEs can focus on implementing traceability by making colossal process changes before embarking on a smoother implementation of blockchain technology.

Conclusion

The themes and sub-themes developed after exploring the critical success factors for implementing BCT provide key concepts that can lead to conceptual development of traceability systems for SMEs. The study concluded that empirical researchers can use the proposed sub-themes as constructs for understanding the rigidities indicated under each critical success factors. For example, lack of trust among business partners can be addressed by leveraging the use of smart contracts to track the history of trusteeship and journey of an asset in real-time (Jin and Hurd, 2018). With many stakeholders involved in the supply chain of SMEs in Kenya, developing and operating a sustainable traceability system calls for incessant collaboration with both competitors and supply chain partners. Therefore, each theme plays a crucial role in providing researchers and practitioners allied to the SME sector with a basis for further descriptive and empirical research in implementing BCT for traceability purposes.

References

Agrawal, T. K., Kumar, V., Pal, R., Wang, L., & Chen, Y. (2021). Blockchain-based framework for supply chain traceability: A case example of textile and clothing industry. *Computers & industrial engineering*, *154*, 107130.

Agung, S. (2022). Blockchain Technology as Corporate Governance Innovation Model for SMEs. In *Advances in Intelligent Networking and Collaborative Systems: The 14th International Conference on Intelligent Networking and Collaborative Systems (INCoS-2022)* (Vol. 527, p. 253). Springer Nature.

Ahmed, W. A., & MacCarthy, B. L. (2021). Blockchain-enabled supply chain traceability in the textile and apparel supply chain: A case study of the fiber producer, Lenzing. *Sustainability*, *13*(19), 10496.

Alibhai, S., Bell, S., & Conner, G. (2017). What's happening in the missing middle?: lessons from financing SMEs.

Angeloska, A., Trendov, N. M., & Vida, I. (2020). Blockchain: Revolutionizing the Agri-Food

Supply Chain by Building Trust and Transparency. *Economics and Management in times of change*, 7.

Baralla, G., Pinna, A., & Corrias, G. (2019, May). Ensure traceability in European food supply chain by using a blockchain system. In *2019 IEEE/ACM 2nd International Workshop on Emerging Trends in Software Engineering for Blockchain (WETSEB)* (pp. 40-47). IEEE.

Bischoff, O., & Seuring, S. (2021). Opportunities and limitations of public blockchain-based supply chain traceability. *Modern Supply Chain Research and Applications*.

Blut, M., & Wang, C. (2020). Technology readiness: a meta-analysis of conceptualizations of the construct and its impact on technology usage. *Journal of the Academy of Marketing Science*, *48*(4), 649-669.

Bracci, E., Tallaki, M., Ievoli, R., & Diplotti, S. (2021). Knowledge, diffusion and interest in blockchain technology in SMEs. *Journal of Knowledge Management*.

Casino, F., Kanakaris, V., Dasaklis, T. K., Moschuris, S., Stachtiaris, S., Pagoni, M., & Rachaniotis, N. P. (2021). Blockchain-based food supply chain traceability: a case study in the dairy sector. *International Journal of Production Research*, *59*(19), 5758-5770.

Casino, F., Kanakaris, V., Dasaklis, T. K., Moschuris, S., & Rachaniotis, N. P. (2019). Modeling food supply chain traceability based on blockchain technology. *Ifac-Papersonline*, *52*(13), 2728-2733.

Castleberry, A., & Nolen, A. (2018). Thematic analysis of qualitative research data: Is it as easy as it sounds? *Currents in pharmacy teaching and learning*, *10*(6), 807-815.

Chege, S. M., & Wang, D. (2021). The influence of the entrepreneur's open innovation strategy on firm performance: empirical evidence from SMEs in Kenya. In *Research Anthology on Small Business Strategies for Success and Survival* (pp. 522-546). IGI Global.

Chen, J., Chen, S., Liu, Q., & Shen, M. I. (2021). Applying blockchain technology to reshape the service models of supply chain finance for SMEs in China. *The Singapore Economic Review*, 1-18.

Chern, B. T. P., & Aun, T. B. (2021). Blockchain Adoption among Malaysian SMEs: A Critical Review on the Supply Chain Implications.

Cocco, L., Mannaro, K., Tonelli, R., Mariani, L., Lodi, M. B., Melis, A., ... & Fanti, A. (2021). A blockchain-based traceability system in agri-food SME: Case study of a traditional bakery. *IEEE Access*, *9*, 62899-62915.

Dasaklis, T. K., Casino, F., & Patsakis, C. (2019). Defining granularity levels for supply chain traceability based on IoT and blockchain. In *Proceedings of the international conference on omni-layer intelligent systems* (pp. 184-190).

Dasaklis, T. K., Voutsinas, T. G., Tsoulfas, G. T., & Casino, F. (2022). A Systematic Literature Review of Blockchain-Enabled Supply Chain Traceability Implementations. *Sustainability*, *14*(4), 2439.

Demestichas, K., Peppes, N., Alexakis, T., & Adamopoulou, E. (2020). Blockchain in agriculture traceability systems: A review. *Applied Sciences*, *10*(12), 4113.

Douglas, J., Douglas, A., Muturi, D., & Ochieng, J. (2017). An exploratory study of critical success factors for SMEs in Kenya. In *Toulon-Verona Conference" Excellence in Services* (pp. 223-234).

Gusenbauer, M. (2019). Google Scholar to overshadow them all? Comparing the sizes of 12

academic search engines and bibliographic databases. *Scientometrics*, *118*(1), 177-214.

Hader, M., Tchoffa, D., El Mhamedi, A., Ghodous, P., Dolgui, A., & Abouabdellah, A. (2022). Applying integrated Blockchain and Big Data technologies to improve supply chain traceability and information sharing in the textile sector. *Journal of Industrial Information Integration*, *28*, 100345.

Hastig, G. M., & Sodhi, M. S. (2020). Blockchain for supply chain traceability: Business requirements and critical success factors. *Production and Operations Management*, *29*(4), 935-954.

Hervas-Oliver, J. L., Sempere-Ripoll, F., & Boronat-Moll, C. (2021). Technological innovation typologies and open innovation in SMEs: Beyond internal and external sources of knowledge. *Technological Forecasting and Social Change*, *162*, 120338.

Huang, H., Zhou, X., & Liu, J. (2019). Food supply chain traceability scheme based on blockchain and EPC technology. In *International Conference on Smart Blockchain* (pp. 32-42). Springer, Cham.

Jin, H., & Hurd, F. (2018). Exploring the impact of digital platforms on SME internationalization: New Zealand SMEs use of the Alibaba platform for Chinese market entry. *Journal of Asia-Pacific Business*, *19*(2), 72-95.

Kaur, J., Kumar, S., Narkhede, B. E., Dabić, M., Rathore, A. P. S., & Joshi, R. (2022). Barriers to blockchain adoption for supply chain finance: the case of Indian SMEs. *Electronic Commerce Research*, 1-38.

Li, J., Zhu, S., Zhang, W., & Yu, L. (2020). Blockchain-driven supply chain finance solution for small and medium enterprises. *Frontiers of Engineering Management*, *7*(4), 500-511.

Lesiit, L. L. (2020). *Block Chain Technology to enhance food traceability and safety: case study of Agriculture Industry in Kenya* (Doctoral dissertation, Strathmore University).

Mann, S., Potdar, V., Gajavilli, R. S., & Chandan, A. (2018). Blockchain technology for supply chain traceability, transparency and data provenance. In *Proceedings of the 2018 international conference on blockchain technology and application* (pp. 22-26).

Martín-Martín, A., Orduna-Malea, E., Thelwall, M., & López-Cózar, E. D. (2018). Google Scholar, Web of Science, and Scopus: A systematic comparison of citations in 252 subject categories. *Journal of informetrics*, *12*(4), 1160-1177.

Mirabelli, G., & Solina, V. (2020). Blockchain and agricultural supply chains traceability: Research trends and future challenges. *Procedia Manufacturing*, *42*, 414-421.

Muganda, L., Ondulo, J., & Rambim, D. (2020). Technological Decentralization and Livestock Data Management in Kenya: The Moderating Effect of Blockchain Technology. *International Journal of Advanced Research in Computer and Communication Engineering*, *9*(5), 42-48.

Mutamimah, M., Alifah, S., & Adnjani, M. D. (2022). Blockchain Technology as Corporate Governance Innovation Model for SMEs. In *International Conference on Intelligent Networking and Collaborative Systems* (pp. 253-263). Springer, Cham.

Mutiso, A., & Maguru, B. (2020). An Assessment of the Adoption of Cryptocurrency As a Mode of Payment By Smes in Kiambu County, Kenya. *International Journal of Social Science and Economic Research*, *5*(7), 2000-2013.

Nayak, G., & Dhaigude, A. S. (2019). A conceptual model of sustainable supply chain

management in small and medium enterprises using blockchain technology. *Cogent Economics & Finance*, *7*(1), 1667184.

Nuryyev, G., Wang, Y. P., Achyldurdyyeva, J., Jaw, B. S., Yeh, Y. S., Lin, H. T., & Wu, L. F. (2020). Blockchain technology adoption behavior and sustainability of the business in tourism and hospitality SMEs: An empirical study. *Sustainability*, *12*(3), 1256.

Omar, I. A., Debe, M., Jayaraman, R., Salah, K., Omar, M., & Arshad, J. (2022). Blockchain-based Supply Chain Traceability for COVID-19 personal protective equipment. *Computers & Industrial Engineering*, *167*, 107995.

Osano, H. M. (2019). Global expansion of SMEs: role of global market strategy for Kenyan SMEs. *Journal of Innovation and Entrepreneurship*, *8*(1), 1-31.

Petersen, M., Hackius, N., & von See, B. (2018). Mapping the sea of opportunities: Blockchain in supply chain and logistics. *it-Information Technology*, *60*(5-6), 263-271.

Rakshit, S., Islam, N., Mondal, S., & Paul, T. (2022). Influence of blockchain technology in SME internationalization: Evidence from high-tech SMEs in India. *Technovation*, 102518.

Rejeb, A. (2018). Halal meat supply chain traceability based on HACCP, blockchain and internet of things. *Acta Technica Jaurinensis*, *11*(1).

Ruzza, D., Morandini, L., & Chelli, A. (2022). Blockchain Application to the SMEs in the Food Industry: Trusty Case Study. In *Blockchain Technology Applications in Businesses and Organizations* (pp. 19-42). IGI Global.

Rybicka, J., Tiwari, A., & Leeke, G. A. (2016). Technology readiness level assessment of composites recycling technologies. *Journal of Cleaner Production*, *112*, 1001-1012.

Sundler, A. J., Lindberg, E., Nilsson, C., & Palmér, L. (2019). Qualitative thematic analysis based on descriptive phenomenology. *Nursing open*, *6*(3), 733-739.

Sunny, J., Undralla, N., & Pillai, V. M. (2020). Supply chain transparency through blockchain-based traceability: An overview with demonstration. *Computers & Industrial Engineering*, *150*, 106895.

Testi, N. A. (2022). Triple Helix Approach for the Diffusion of Blockchain Technology against Counterfeiting of Made in Italy Products in SMEs of the Marche Region.

Tsang, Y. P., Choy, K. L., Wu, C. H., Ho, G. T. S., & Lam, H. Y. (2019). Blockchain-driven IoT for food traceability with an integrated consensus mechanism. *IEEE access*, *7*, 129000-129017.

UNGC. (2014). A Guide to Traceability: A Practical Approach to Advance Sustainability in Global Supply Chains, 7.

Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis.

Wang, Z., Wang, T., Hu, H., Gong, J., Ren, X., & Xiao, Q. (2020). Blockchain-based framework for improving supply chain traceability and information sharing in precast construction. *Automation in construction*, *111*, 103063.

Wong, L. W., Leong, L. Y., Hew, J. J., Tan, G. W. H., & Ooi, K. B. (2020). Time to seize the digital evolution: Adoption of blockchain in operations and supply chain management among Malaysian SMEs. *International Journal of Information Management*, *52*, 101997.

Westerkamp, M., Victor, F., & Küpper, A. (2018). Blockchain-based supply chain traceability: Token recipes model manufacturing processes. In *2018 IEEE International Conference on*

Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData) (pp. 1595-1602). IEEE.

Whiteley, T. (2020). *An Investigation of the Implementation of Blockchain in the Food Supply Chain of Ireland* (Doctoral dissertation, Dublin, National College of Ireland).