# Exploits of blockchain technology in supply chain finance: a blockchain-as-a-service perspective for Ghana's SMEs

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**ABSTRACT**: *The implementation of blockchain technology in supply chain finance (BcSCF) offers a conducive way for entrepreneurial financing. Extending the resource-based view (RBV), a traditional perspective approach is espoused to trigger scholarly discussions, pining the development of research fronts on Blockchain-as-a-Service (BaaS) in addressing small and medium-sized enterprises (SME) financing constraints. This paper suggests that, despite the operational challenges of blockchains and the necessity to focus on core business activities, BaaS is promising, with significant efforts in terms of cost-savings, efficiency, and reliability with reduced risks. This study provides insight on BaaS contributions to fostering entrepreneurial finance as well as contributing to the literature on the accomplishments of BaaS within BcSCF provisions for particularly Ghanaian SMEs. Therefore, detailed studies into the viability of technologically-enabled types of SME finance are essential, necessitating more research. Resultantly, some forward-thinking research issues for researchers in the disciplines of innovation, technology, entrepreneurship, finance, and decision science have been presented.*

**KEYWORDS**: Blockchain Technology; Blockchain-as-a-Service; Resource Based-View; Supply Chain Finance; SMEs financing

## INTRODUCTION

Small and medium-sized enterprises (SMEs) make up a significant portion of the business world, providing jobs and contributing to productivity (Ayyagari et al., 2007; Beck & Cull 2014; de la Torre et al., 2010). SMEs in Ghana are no different from their counterparts, with about 85% employer contribution to the manufacturing sector, 70% to the country's GDP, and close to 92% of total businesses (Aryeetey, 2001), promoting industrialization of rural communities and narrowing regional imbalances. Primarily, the broader realization of both economic and socio-economic gains can be attributed to the successes of SMEs as a facilitating tool (Cook & Nixson, 2000), with well-made assertions on the remarkable roles in the creation

of jobs, the emergence of new ideas, contributions to the welfare of people, and gross domestic products (GDP) of economies globally (Ayyagari et al., 2011).

Additionally, SMEs promote the development of local linkages for accelerated industrial growth, through the continual reliance on raw materials locally, boosting their deployment, and assuring a more balanced regional development (Oppong et al., 2014). Regardless of the vast offerings, several issues impede SMEs, with chief among them being funding (Ayyagari et al., 2011; Beck et al., 2005; Carpenter & Petersen, 2002). Several global surveys have all constantly reported funding as the most crucial constraint to the performance and survival of SMEs (Ayyagari et al., 2007; Beck & Cull, 2014; Dong & Men, 2014). Supply chain finance (hereafter SCF) has recently emerged as a viable solution for SMEs facing financial difficulties. SCF is a financing model in which financial institutions connect upstream, downstream, and core firms to deliver flexible financial products and services (Du et al., 2020a;). It has become an innovative financing way for SMEs to easily obtain credit (Ali & Gongbing, 2018). Working capital, inventory finance, reverse-factoring, and consignment stock are all examples of SCF's dynamic nature in meeting the financial needs of SMEs (Damianos & Alejandro, 2016; Du et al., 2020b; Hofmann, 2005; Klapper, 2006).

Regardless, inequality and information asymmetry are prevalent across SCF, which play critical roles in information flow, capital, and logistical management (Du et al., 2020c). Also information asymmetry, adverse selections and moral hazards are inevitable, thereby increasing the cost of transactions and default risk levels (Abdullah & Manan, 2011). Supplier onboarding issues, high-interest rates, costly and difficult financial processing, insufficient real-time data, and trust infrastructure are all present (Euro Banking Association 2014; PwC 2018). The implementation of blockchain technology in supply chain finance (hereinafter BcSCF) aims to address these issues and improve service efficiency. BcSCF entails the use of cutting-edge technology to foster trust, as well as the efficient movement of information, finance, and logistics (Gao et al., 2018). It also provides relief to business funding by lowering operating costs associated with compliance and consolidated corporate operations (Treat et al., 2017), simplifying the framework of financial activities, and reducing costs by employing distributed ledgers (Cocco et al., 2017). According to Wang et al. (2018), BcSCF ensures complete exchange and credible financial cooperation, bringing on board the efficient flow of information, logistics, and capital to overcome information asymmetry challenges. It promotes secure, accurate, and reliable information sharing (Choi et al., 2019; Wang et al., 2019a). Also, BcSCF offers decentralized services that speed up business activities, make financing less costly (Choi et al., 2019b), significantly improve transactions across supply chains (Chen et al., 2020).

Currently, BcSCF plays a crucial role in SME funding (Zhu et al., 2019) and increasingly becoming pivotal for SME growth (Christidis & Devetsikiotis 2016a; Wang et al., 2019c). Despite the positive contributions in stimulating the espousal of BcSCF, a significant portion of SMEs has been excluded from its funding options. This can be ascribed to technology adoption drivers such as the infrastructural availability for blockchains, (Hughes et al., 2019; Nam et al., 2015), issues of complexity (Babich & Hilarya, 2020; Hayes, 2017), issues of privacy, and security (Morabito & Morabito 2017; Zamani & Giaglis 2018). Also are

organizational factors such as inadequate expertise (Babich & Hilary 2020b; Verma 2017), organization readiness (Folkinshteyn & Lennon, 2016), higher investment costs (Brilliantova & Thurner, 2019), and environmental issues such as inadequate legal and regulatory policies (Mendling et al., 2018; Zamani & Giaglis, 2018), social trust (Biswas & Gupta, 2019; Lu & Xu, 2017), lower levels of penetration (Coffie & Zhao, 2021), inadequate governmental support (Folkinshteyn & Lennon, 2016). Furthermore, is the local social dynamics and how the technology will be used (Moodley, 2005). Nonetheless, the emergence of Blockchain-as-a-Service (hereinafter BaaS) provides relief from the numerous obstacles that SMEs face, particularly in terms of blockchain-enabled technology consumption, adaption, and complete deployment. BaaS can provide an effective platform with appropriate support systems as a service provided by an organization through the integration of blockchains into cloud computing infrastructure (Shi, 2019). As a result, organizations may profit from their distinctive traits without having to focus on technological complexity. As such, SMEs should explore BaaS while reaping the multiple benefits of BcSCF in terms of cost-savings, efficiency, and dependability while avoiding the dangers that have previously warped the SCF. This also allows them to concentrate more intently on their primary business operations. The service provider sets up the technical infrastructure, including resource allocation, hosting needs, and data security. Although some preliminary forecasts about BcSCF's effects have been made, a comprehensive blueprint of its effects on SME finance has yet to be developed. Although there has been consensus on the relevance of BcSCF solutions, literature especially on SMEs from a developing country perspective is inceptive with limited studies. Prior research on SMEs in Ghana has principally focused on their roles, developments, challenges, and policy interventions (Abor & Biekpe, 2006; Abor & Quartey, 2010; Akorsu & Agyapong, 2012; Asare, 2014; Kwaku Amoah, 2018; Kwaning Mbroh, 2015; Oppong, Owiredu, & Churchill, 2014). SMEs in Ghana may have inadequate capital to invest in recent technologies (Abor & Quartey, 2010) yet, they share the same need to be efficient and effective in allocating and managing their resources to accommodate technological evolutions (Erol et al., 2016). SMEs can no longer rely on traditional financing processes (Christopher, 2018), thus they would need to view technology as an investment rather than a cost for growth (Asare, 2014). Therefore, the ability of Ghanaian SMEs to utilize technology and take advantage of opportunities provided by seamless and global platforms will be critical to their success (Kwaku Amoah, 2018). In response, this study aims to investigate and add to the literature in areas where research is still in its early stages. The study's first goal is to assess how successful BcSCF may be in terms of boosting entrepreneurial finance. This can be achieved by extending the resource-based view (RBV) theory. Secondly, to evaluate the need for BaaS in BcSCF efforts whilst promoting entrepreneurial finance. Thirdly, to initiate an academic discourse and the advancement of research fronts necessary in addressing the BaaS efforts in enhancing entrepreneurial financing especially for SMEs in Ghana.

## RELATED LITERATURE

### Blockchain Technology

The underlying technology underpinning distributed ledgers is blockchain technology, which allows non-trusting parties to communicate and verify with one another over a peer-to-peer network without the need for a trusted authority (Christidis & Devetsikiotis, 2016b). By

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concentrating on advances in total factor productivity and creative disruptive influence on employment, organizations, and markets, Pilkington (2016) shows blockchain technology is a general-purpose technology. However, Nelson & Sampat (2001) by concentrating on it as a new coordinating technology that communicates the economic actions of a group of people, and as an institutional alternative to corporations and markets, blockchain may be argued as an institutional technology. Zachariadis et al. (2019) describe those new details of transactions after validation by members are tied up into blocks sequel to previous ones in a logical order and are distributed across the network to maintain the authenticity of the database.

Davidson et al. (2016) investigate the scope of blockchain technology and posit an evolution into technology for decentralization before the economics of information and new technology. Blockchain 2.0 was released as new development to broaden the uses of distributed ledger technologies (DLT) above digital cryptocurrencies. Blockchain 3.0 was aimed to enhance the abilities of blockchain in terms of transaction time, scalability, and ease of implementation with the use of decentralized applications (dApp) Raval (2016).
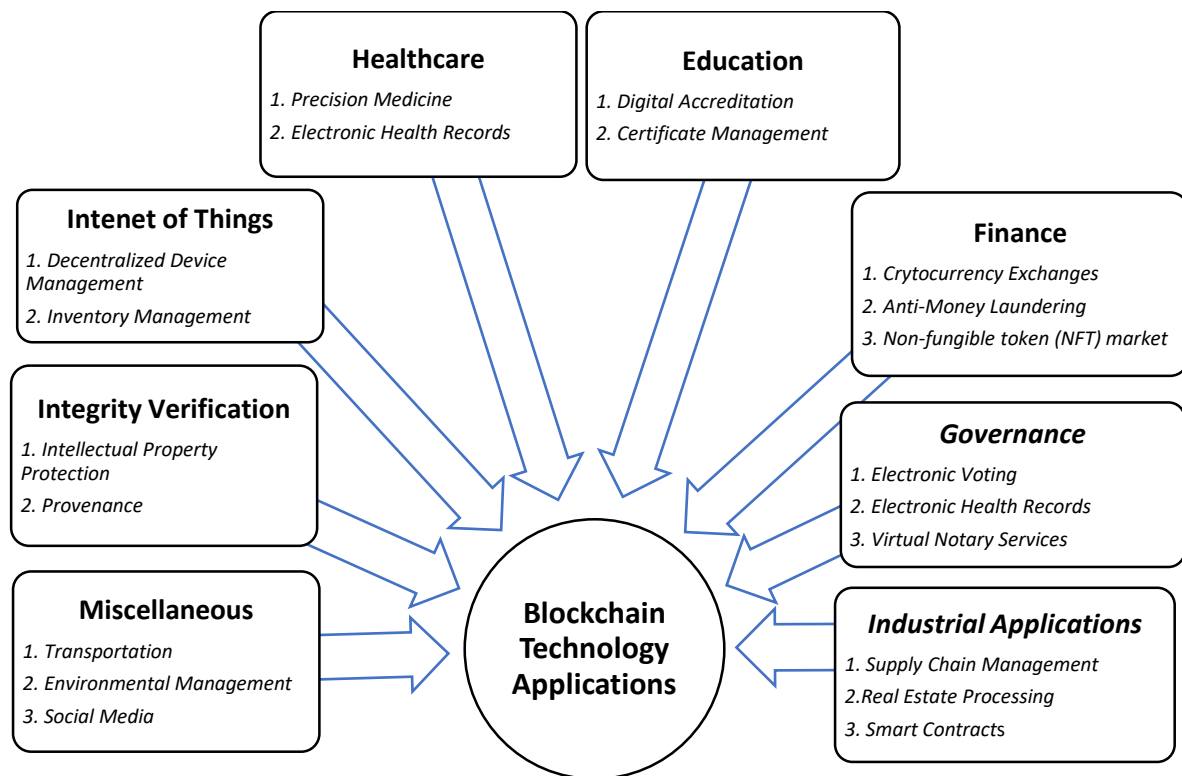


Figure 1 Mind mapping of Blockchain Technology Applications]
Source: Adapted from (Asante et al., 2022; Casino et al., 2019; Sam, 2021)

Figure 1 above shows the abstraction of several types of blockchain applications in a variety of fields, including commerce and industrial applications, healthcare, finance, governance,

education, IoTs, integrity verification, and other applications. It also demonstrates the extent to which blockchain has been implemented in these industries. For example, blockchain can be used for cryptocurrency exchanges, anti-money laundering tracking systems, and non-fungible token marketplaces in the financial sector.

**Operations of Blockchain in Supply Chains**
Chod et al. (2018) highlight the added value to supply chain management by blockchain technology in the area of financing. Choi (2019), using utility models of consumers describes the blockchain technology values with the case of Everledger which applies blockchain in the supply chains of diamonds. Choi (2020) explores the need for governmental oversight over blockchain technology implementations. The author provides additional highlights for emerging economies in the context of quality of information across supply chains for the fashion industry. Wang et al. (2019) position's paper discusses the prospects of blockchain in changing the management of contemporary value chains. Choi et al. (2020) study how blockchain could help in the identification of consumer risk preferences using a blockchain-enabled demand service platform. Lu & Xu (2017) offer a prototype on how blockchain could be used in product traceability systems across China, reaffirming the tamper-proof and transparent ability in the area of data traceability.
Accomplishments of BcSCF

BcSCF offers a new breed of cheaper financing products such as working capital management, technology offerings, and open account trade (Mainelli & Milne 2016). The flow of funds may be gradually rationalized in this framework, with participating members being able to distribute, retain records, and have real-time access to transactions via digital means. Treat et al. (2017), describe the respite it brings to the financing of businesses through saving operational costs related to compliance and centralized business operations. Additionally, Cocco et al. (2017) highlight a provided and simplified framework of financial activities that reduce costs by employing distributed ledgers. Sarmah et al. (2007) using the credit option, examine the challenges facing the coordination of supply chain channels. Their study explores the contract of "profit-sharing" and describes how this can optimize the performance of supply chains. Cai et al. (2019) study the challenges of traditional supply chain finance in the fashion industry. The authors using probability measures modelled an optimization objective to describe the changes that could emerge with different payment schedules. Chen & Wang (2012) on considerations of limited liability, study the "trade-credit contract". Uncovering how the trade credit contract performs under modelled supply chain system with constraints of capital. Guo & Liu (2020) examine the problem of "cash flow shortage" in bulk customization supply chains.

Applying simulated optimizations, van der Vliet et al. (2015), examine how the terms of payment can benefit both suppliers and buyers. Lekkakos & Serrano (2016) show members across the chain enjoy reduced financial costs. Cocco et al. (2017) study blockchain in banking. The authors underline the ledger's inherent security value, which allows for the secure storage and monitoring of all transactions while also allowing for the evaluation of investment potential. The studies above have all looked at how blockchain could alter and reorganize commercial supply networks and supply chain financing. They have not, however, addressed

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several basic problems in terms of socio-technical needs for using this technology, particularly in the area of SME funding. As a result, it is now acceptable for SMEs to investigate BaaS and make use of blockchain technology's benefits

## The Resource-Based View (RBV) Disposition

The RBV as an economic tool shares the view that the internal resources of a firm determine its competitive advantage and economic success. Its underlying assumption is the existence of firm-specific resources that are valuable, rare, inimitable, and non-substitutable (VRIN) (Barney, 1991). The seminal work of (Barney, 1991) provided accurate dispositions about resource view perspective by describing its two main roles; heterogeneity and immobility (Mata et al.,1995). Effective internal resource exploitation improves business operations, resulting in a competitive advantage. It is commonly assumed that improving business performance is primarily dependent on the availability of resources and how they are used efficiently and effectively. We adopt Barney's (1991) theory of RBV to establish the implementation of BcSCF in improving entrepreneurial finance.

Barney stated that firms had a variety of resources and that fully employing them might result in feasible outcomes. We believe that BcSCF adoption will serve as a resource for SMEs, boosting funding initiatives that will help them improve their performance and growth. BcSCF is largely used to address the many difficulties that SCF has in terms of cost, efficiency, dependability, and risk. To Crook et al. (2008), RBV is a pivotal perspective that offers a guided inquiry into the factors that influence business performances. The RBV has been used by many academics to illustrate how a firm's resources are used to achieve improved performance (Melville et al., 2004). Rivard et al. (2006) studied the relationship between IT resources and performance by employing RBV in SMEs. They found that IT resources significantly enhance the operations of firms. Lily & Hartini, (2010) studied the relationship between firms' resources and product innovation performance by integrating the resource-based perspective in the Malaysian context. They found that intangible resources are the main predictors of product innovation performance. A recent study by Yang & Lirn, (2017), applied the RBV to evaluate the interactions among firm resources, logistic service and logistic performance. They concluded that, logistics service capabilities and inter-firm relationships mediates the relationship between intra-firm relationship and logistics performance.

This shows that when SMEs invest firm-level resources, they are primarily making decisions that will have a financial and overall impact on the business. Businesses are currently adopting and deploying a variety of automation solutions to improve their economic performance (Al-Mashari, 2001), and the cases of SC performances are no exception. Parties from all over the SC are concerned about the use of technologically advanced platforms to promote their operations (Caniato et al., 2016). With the rise of technology for development, SMEs are now focusing on digitally adopting transparent and well-managed systems to help them run their businesses more efficiently, which necessitates attention to their financial needs (Fairchild, 2005).

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Perego & Salgaro (2010), contend that digitizing business processes offer a higher decline in the cost of operations relative to manual-based trading. This presupposed that third-party costs would be decreased as a result of digitization, which is a feature of deploying technology (BcSCF). Resultantly, Caniato et al. (2016) highlight that businesses that embrace a higher level of digitization are more likely to implement new and innovative finance alternatives. Kindström & Kowalkowski (2014) highlight the deployment of business operations technology helps the creation of cost-effective activities by supplying the proper information to and from the firm's borders. These tools allow financial institutions to assess the creditworthiness of SMEs before approving loans.

The current research suggests that BcSCF is a significant resource that may help the firm's efforts and, as a result, improve the efficient movement of money, information, and logistics throughout the SCF. The movement of money may be continuously simplified digitally as a result of this, allowing for the transparent sharing and monitoring of financial information among participating members with real-time access to supply chain finance data. Understanding and optimizing the firm's working capital is critical for entrepreneurs to conduct daily operations and achieve the firm's goals. As a result, it is stated that BcSCF is an internal resource that, when properly utilized by SMEs, may lead to effective and efficient SCF operations, competitive advantage, and greater firm performance. We claim that, by expanding the RBV theory, BcSCF is a novel resource for boosting SCF-related activities, making it more cost-effective, efficient, and dependable, with fewer risks in encouraging entrepreneurial finance for SME growth. We also believe that BcSCF assists SMEs in meeting both their financial and operational demands digitally, increasing transaction flexibility and visibility.

### Blockchain-as-a-Service (BaaS)

Technology firms supply BaaS to assist businesses in navigating the difficulties of blockchain operations. Its engagement model, which is comparable to Software-as-a-Service, is accelerating blockchain acceptance and dissemination among businesses (Pratik, 2018). BaaS is a cloud-based service that allows developers to digitally construct blockchain-enabled goods like decentralized apps (dApps), which allow clients to access services to enhance commercial activity. An organization uses the services of a service provider to build up and manage a blockchain infrastructure, with technical help such as hosting, deploying, and settings available (Jake, 2020). As a result of the vast variety of operational, integrational, and deployment considerations, the operations are highly complicated, particularly for SMEs. BaaS may be used in a variety of domains, from supply chains to finance, providing organizations with fantastic opportunity to promote technology and innovation in connected fields. Additionally, this increases the prospects for an enterprise to attain future success (Pratik, 2018). For IoT purposes, Baas can be implemented to contribute to society development Samaniego et al. (2016), in the management of operations for organizations (Alibaba Cloud, 2019), and the management of smart contracts in financing (Amazon, 2021). A BaaS solution's architecture usually consists of four components, as indicated in the diagram.
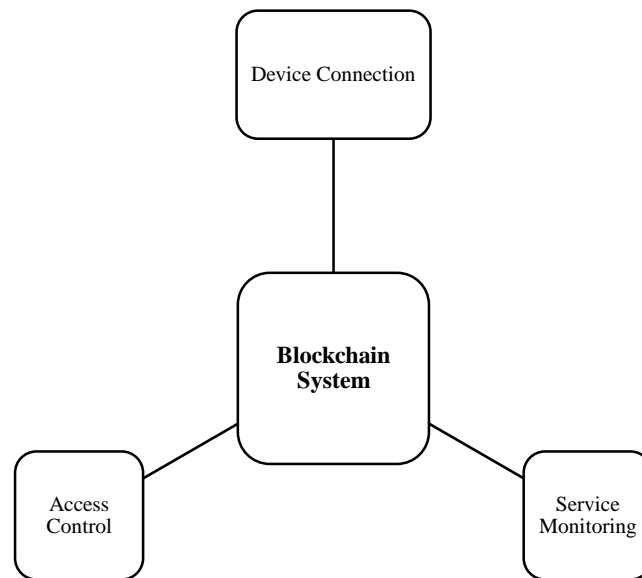
Figure 2 here: BaaS architecture]
Source: Adapted from (Shi, 2019).

Computing resources can be diffused with the exploitation of BaaS, creating a secure and decentralized prototype with characteristics like security, protection of privacy, and transparency (Mendis et al., 2020). Also is in the application of the consensus mechanisms, pricing models, and distributed ledger technologies (DLTs) (Kernahan et al., 2021). Amazon, IBM, and other major players are among the significant players. The BaaS industry, which includes Microsoft, Oracle, Corda, IBM, SAP, Accenture, Stratis, Huawei, and Baidu, is expected to be worth USD 25 billion by 2027, with a compound annual growth rate (CAGR) of 39% (Fortune Business Insights 2019). This opens up the possibility of employing external providers' cloud-based services to manage and administer blockchain-enabled activities that are critical to corporate innovation, growth, and development. As a consequence, businesses may concentrate on their core strengths and business activities while outsourcing blockchain-related tasks like bandwidth management, data protection, and resource allocation to specialists. This opens up the possibility of employing external providers' cloud-based services to manage and administer blockchain-enabled activities that are critical to corporate innovation, growth, and development. As a consequence, businesses may concentrate on their core strengths and business activities while outsourcing blockchain-related tasks like bandwidth management, data protection, and resource allocation to specialists.

**Need for BaaS**
Blockchain technology is critical for economic development, offering support to consumers and enterprises (Nguyen, 2016). Its prospects provide benefits in terms of efficiency, cost-effectiveness, and trust in business activities across several economic sectors (Pal et al., 2019). With BaaS, businesses may test this new technology before committing to its adoption, removing the associated complications and lowering costs. They may also create unique utility

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solutions before committing to these expensive and complex technologies. To properly communicate and use blockchain for business activities, the relevant nodes must be set up and maintained. However, this technically difficult and time-consuming process serves as a significant impediment to blockchain acceptance, dissemination, and implementation, particularly among SMEs throughout the world.

Even though many businesses and individuals are increasingly interested in using blockchain technology to enhance their operational activities, numerous internal and external variables are proving to be obstacles. Furthermore, sociotechnical factors complicate the construction, management, and administration of blockchain technology infrastructure on both an operational and technical level. SMEs can equally leverage this trendy technology, serving as a wheel for innovation to enhance their operations for the good of society (Pratik, 2018). As a result of SMEs adopting BaaS, they get accountability, increased transparency, immutability, trust, and data security without having to build their blockchain infrastructure or invest in expensive in-house computers. For BaaS to be adopted, these elements must be present:

1.      Cost-savings: The establishment and maintenance of a blockchain technology infrastructure necessitate large cash commitments. It is said to be extremely resource-intensive when compared to other traditional databases. Hosting, maintenance, bandwidth, staff, and energy are all costs involved with blockchain technology. Due to the operational complications of maintaining a blockchain technology infrastructure, professionals with suitable competencies are required, which incurs additional expenditures in addition to those directly linked to a company's core activities. These additional expenditures are avoided with the adoption of BaaS, allowing SMEs to focus their efforts on other elements of their business to fulfill their operational needs and expand and develop. Instead of needing to set up and administer a whole blockchain technology database, this aspect is required to consider BaaS.

2.      Efficiency: Proof of Stake (PoS) and Proof of Work (PoW) on blockchains ensure increased efficiency and flexibility in a variety of business areas, including value chains, financial services, healthcare, and insurance. Furthermore, Distributed Ledger Technologies (DLT) create a trust mechanism in which information and financial movements are visible, traceable, and easy to manage (Pilkington 2016a; Catalini & Gans, 2016a; Ahram et al., 2017; Prybila et al., 2017). The personalized flexibility of BaaS enables organizations to fight and mend difficult challenges related to efficiency and transparency in a simpler term through automation and optimization, decreasing the blockchain entry hurdles for enterprises. SMEs cannot afford to ignore these requirements, but because they lack the specialized competence required to manage blockchain infrastructures, it is necessary to consider BaaS, in which third parties would efficiently handle the operationalizations. This will also allow them to focus on their core strengths while saving time and money.

3.      Reliability with reduced risks level: The distributed ledger technology (DLT) enabled by blockchain facilitates the simple verification of customers' shared records. To lower the costs associated with counterparty and privacy concerns, verification is critical for business flows (orders, purchases), information flows (documents, contracts), and financial flows (payments, discounts, prepayments). Transacting parties must be able to efficiently verify and analyze transactions using blockchains' costless verification for markets to thrive (Catalini & Gans, 2016b). If these promises hold, SMEs should select Baas since they will receive a better

service than if they manage the blockchain infrastructure themselves. The importance of blockchain technology cannot be overstated, but BaaS makes it possible to enjoy it with simplicity. Service providers can be counted on to give nothing but the finest because it is their main competency, and SMEs can focus their resources, time, and experience on their core business. This delivers risk reduction functions to players throughout the financing ecosystem, boosting resilience in the face of the ecosystem's many problems. Blockchain technology's consensus-building method improves automatic trust among clients when immutable datasets are exchanged for simple identification and tracking (Pilkington, 2016b).

**BaaS value for BcSCF in SME Financing**
The BaaS industry is now dominated by larger firms, who have outsourced technological capabilities linked to blockchain systems to third parties to focus entirely on their main activities. This would be even better for SMEs, as bespoke blockchain-enabled apps and services could be created to fit their needs. Because of the operational complexities, costs, and skills required, SMEs should consider BaaS rather than designing their infrastructure to take advantage of the benefits blockchain technology provides in terms of data immutability and security, consensus mechanisms, flexibility, and efficiency. Similarly, BaaS enables SMEs to quickly adapt to technology, regardless of the requirement for blockchain infrastructure architecture. The existence of information asymmetry in supply chain finance encourages unfavorable selects and moral hazards during SME financing, raising transaction costs and default risk levels. Subsequently, administering loans for SMEs becomes more expensive, generating disruptions in the overall financial ecosystem. (Abdullah & Manan, 2011b). The distributed ledger technologies (DLT) used by BcSCF enable a database where real-time data is stored and disseminated among the participants. To solve information asymmetry difficulties, BcSCF provides total interchange and credible financial cooperation in the supply chain, bringing on board the efficient flow of information, logistics, and capital (Wang et al., 2018). Furthermore, the flow of cash between parties is standardized, resulting in improved financing procedures, responsibilities, and methods across the whole funding ecosystem (Babich & Hilary, 2019b). The movement of funds may be streamlined as all stakeholders in the ecosystem will have digital access to real-time precise information, communication records, and transactions. It provides a platform for transacting parties to build trust and facilitate the efficient transfer of capital and information with speed, transparency, and simplicity.

The introduction of blockchain technology offers the best option for SME funding, with worldwide access to trade financing and the use of BaaS removing the numerous bureaucrats in the process. SME finance cannot afford to miss out on the benefits of blockchain technology, and one way to do so is to embrace BaaS. These services are also critical for SMEs to consider, especially as BaaS is one of the most significant options for the future. Research Trends

This traditional perspective article conveys the research concerns below that could help in the further explorations, creating an understanding of the benefits of BaaS.
1) To what extent could BaaS be diffused towards SME growth and development?
2) Will BaaS provide sustainable attributes for SME growth? If so, how, what criterion should SMEs use in selecting a BaaS provider?

3) What socio-technical drivers will influence the adoption and full implementation of BaaS, especially for SMEs?

4) Will BaaS make the traditional supply chain finance "better" or "replace". If better, what socioeconomic and sociotechnical theories could promote such integration?

5) What would be the extent of stakeholder participation and engagements in the adoption and implementation of BaaS for SMEs?

6) Will there be specific conflict of interest issues that would emanate between BaaS providers and other stakeholders across the SME financing ecosystem? If so, how would theories and models be designed to curb these?

7) How would the integration of firm-level characteristics, owner/manager characteristics, and technology characteristics result in a modelled approach to augment the deployment of BaaS towards the growth of SMEs?

**Concerns and Caveats**

We extended the RBV theory and the traditional perspective approach by initially postulating BcSCF as a resource, sharing insights on the BaaS phenomenon, identifying and listing some research questions to initiate academic discourse in this area of study. These issues must be investigated, particularly in the context of growing and developing economies. Experiments that include the transition from case study to pilot stage procedures might be employed using shards of evidence from wealthy countries such as the United States and China. In the pursuit of efficiency through BaaS, caution should be taken not to allow service providers too much authority or autonomy, since this might lead to potential abuse of other parties. There may also be a preference for SMEs with sufficient resources to subscribe to their services, resulting in greater inequalities and disparities across SMEs, making the resourceful more efficient and wealthier while the less resourceful suffer.

Several moral and ethical problems about research must be considered while conducting multidisciplinary investigations. Many technology and creative solutions have been promoted by SMEs internationally, particularly in rising and developing countries. As a result, we support this line of inquiry, urging a further investigation of BaaS's contributions to SME growth and development. BaaS has the potential to accelerate the worldwide adoption of blockchain technology by allowing it to penetrate more deeply into many industries. This offers immutability, verifiability, and transparency to make supply chain finance more robust, in addition to the advantage of trade financing gap bridging. SMEs have a fantastic chance to use blockchain technology thanks to BaaS. Without a doubt, the rise of BaaS will aid enterprises in their exploration of blockchain technology and the development of better solutions. In the future, increased accessibility and acceptance will fuel innovation in industries like healthcare, supply chains, and financial services. BaaS will serve as a vehicle for worldwide adoption to supplement productive activities for economic growth and development, thanks to their efforts.

**References**

Abdullah, M. A., & Manan, S. K. A. (2011). Small and medium enterprises and their financing patterns: Evidence from Malaysia. Journal of Economic Cooperation and Development, 32(2), 1–18.

Abor, J., & Biekpe, N. (2006). Small business financing initiatives in Ghana. Problems and Perspectives in Management, 4(3), 69–77.

Abor, J., & Quartey, P. (2010). Issues in SME development in Ghana and South Africa. International Research Journal of Finance and Economics, 39(39), 218–228.

Ahram, T., Sargolzaei, A., Sargolzaei, S., Daniels, J., & Amaba, B. (2017). Blockchain technology innovations. 2017 IEEE Technology and Engineering Management Society Conference, TEMSCON 2017, 137–141. https://doi.org/10.1109/TEMSCON.2017.7998367

Akorsu, P. K., & Agyapong, D. (2012). ALTERNATIVE MODEL FOR FINANCING SMEs IN GHANA. International Journal of Arts and Commerce, 1(5), 136–148. https://doi.org/10.1080/08985620601137646

Al-Mashari, M. (2001). Process orientation through enterprise resource planning (ERP): a review of critical issues. Knowledge and Process Management, 8(3), 175–185.

Ali, Z., & Gongbing, B. (2018). Does supply chain finance improve SMEs performance ? The moderating role of trade digitization. https://doi.org/10.1108/BPMJ-05-2018-0133

Alibaba Cloud. (2019). Introduction to Blockchain as a Service.

Amazon. (2021). What Is Amazon Managed Blockchain? - Amazon Managed Blockchain.

Aryeetey, E. (2001). Centre on Regulation and Competition WORKING PAPER SERIES. Centre on Regulation and Competition, Institute for Development Policy and Management, 4, 1–47.

Asante, E., Zhao, H., Nana, B., & Ahia, K. (2022). Journal of High Technology Management Research Emerging research on blockchain technology in finance ; a conveyed evidence of bibliometric-based evaluations. Journal of High Technology Management Research, 33(2), 100437. https://doi.org/10.1016/j.hitech.2022.100437

Asare, A. O. (2014). Innovative Ways of Gaining Access to Funds for SMEs Setups in Ghana. European Journal of Business and Management, 6(29), 86–89.

Ayyagari, M., Beck, T., & Demirguc-Kunt, A. (2007). Small and medium enterprises across the globe. Small Business Economics, 29(4), 415–434. https://doi.org/10.1007/s11187-006-9002-5

Ayyagari, M., Demirgüç-Kunt, A., & Maksimovic, V. (2011). Firm innovation in emerging markets: The role of finance, governance, and competition. Journal of Financial and Quantitative Analysis, 46(6), 1545–1580. https://doi.org/10.1017/S0022109011000378

Babich, V., & Hilary, G. (2019). Distributed Ledgers and Operations : What Operations Management Researchers Should Know about Blockchain Technology To cite this version : HAL Id : hal-02005158 Distributed Ledgers and Operations : What Operations Management Researchers Should Know about. Manufacturing and Service Operations Management, INFORMS, In Press, hal-020051.

Babich, V., & Hilary, G. (2020). Distributed ledgers and operations: What operations management researchers should know about blockchain technology. Manufacturing and Service Operations Management. https://doi.org/10.1287/MSOM.2018.0752

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120. https://doi.org/10.1177/014920639101700108

Beck, T., & Cull, R. (2014). SME finance in Africa. Journal of African Economies, 23(5), 583–613. https://doi.org/10.1093/jae/eju016

Beck, T., Demirgüç-Kunt, A., & Maksimovic, V. (2005). Financial and legal constraints to growth: Does firm size matter? Journal of Finance, 60(1), 137–177. https://doi.org/10.1111/j.1540-6261.2005.00727.x

Biswas, B., & Gupta, R. (2019). Analysis of barriers to implement blockchain in industry and service sectors. Computers and Industrial Engineering. https://doi.org/10.1016/j.cie.2019.07.005

Brilliantova, V., & Thurner, T. W. (2019). Blockchain and the future of energy. Technology in Society. https://doi.org/10.1016/j.techsoc.2018.11.001

Cai, Y. J., Chen, Y., Siqin, T., Choi, T. M., & Chung, S. H. (2019). Pay upfront or pay later? Fixed royal payment in sustainable fashion brand franchising. International Journal of Production Economics, 214(April), 95–105. https://doi.org/10.1016/j.ijpe.2019.03.025

Caniato, F., Gelsomino, L. M., Perego, A., & Ronchi, S. (2016). Does finance solve the supply chain financing problem? Supply Chain Management: An International Journal.

Carpenter, R. E., & Petersen, B. C. (2002). Is the Growth of Small Firms Constrained by Internal Finance? The Review of Economics and Statistics, 84(2), 298–309. https://doi.org/10.1162/003465302317411541

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. Telematics and Informatics, 36(November 2018), 55–81. https://doi.org/10.1016/j.tele.2018.11.006

Catalini, C., & Gans, J. S. (2016). Some Simple Economics of the Blockchain. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2874598

Chen, J., Cai, T., He, W., Chen, L., Zhao, G., Zou, W., & Guo, L. (2020). A blockchain-driven supply chain finance application for auto retail industry. Entropy, 22(1), 95. https://doi.org/10.3390/e22010095

Chen, X., & Wang, A. (2012). Trade credit contract with limited liability in the supply chain with budget constraints. Annals of Operations Research, 196(1), 153–165. https://doi.org/10.1007/s10479-012-1119-0

Chod, J., Trichakis, N., Tsoukalas, G., Aspegren, H., & Weber, M. (2018). Blockchain and the Value of Operational Transparency for Supply Chain Finance. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3078945

Choi, T.-M., & He, Y. (2019). Peer-to-peer collaborative consumption for fashion products in the sharing economy: Platform operations. Transportation Research Part E: Logistics and Transportation Review, 126, 49–65. https://doi.org/https://doi.org/10.1016/j.tre.2019.03.016

Choi, T.-M., & Luo, S. (2019). Data quality challenges for sustainable fashion supply chain operations in emerging markets: Roles of blockchain, government sponsors and environment taxes. Transportation Research Part E: Logistics and Transportation Review, 131, 139–152. https://doi.org/https://doi.org/10.1016/j.tre.2019.09.019

Choi, T. M. (2019). Blockchain-technology-supported platforms for diamond authentication and certification in luxury supply chains. Transportation Research Part E: Logistics and Transportation Review, 128(May), 17–29. https://doi.org/10.1016/j.tre.2019.05.011

Choi, T. M. (2020). Supply chain financing using blockchain: impacts on supply chains selling fashionable products. Annals of Operations Research. https://doi.org/10.1007/s10479-020-03615-7

Choi, T. M., Guo, S., Liu, N., & Shi, X. (2020). Optimal pricing in on-demand-service-platform-operations with hired agents and risk-sensitive customers in the blockchain era. European Journal of Operational Research, 284(3), 1031–1042. https://doi.org/10.1016/j.ejor.2020.01.049

Christidis, K., & Devetsikiotis, M. (2016). Blockchains and Smart Contracts for the Internet of Things. IEEE Access, 4, 2292–2303. https://doi.org/10.1109/ACCESS.2016.2566339

Christopher, L. (2018). SME CEO Forum 2018 - How Digital Economy will Disrupt Businesses in Malaysia - Kaodim Kaodim Newsroom.

Cocco, L., Pinna, A., & Marchesi, M. (2017). Banking on blockchain: Costs savings thanks to the blockchain technology. Future Internet, 9(3), 1–20. https://doi.org/10.3390/fi9030025

Coffie, C. P. K., & Zhao, H. (2021). Semi-Systematic Review of the Perceived Cost of Mobile Payment in Sub-Saharan Africa. Perspectives on Global Development and Technology, 20(3), 205–224. https://doi.org/https://doi.org/10.1163/15691497-12341592

Cook, P., & Nixson, F. (2000). Finance and Small and Medium-Sized Enterprise Development. Finance and Development Research Programme, 14, 1–28. https://doi.org/10.1016/S0148-2963(03)00070-5

Crook, T. R., Ketchen Jr., D. J., Combs, J. G., & Todd, S. Y. (2008). Strategic resources and performance: a meta-analysis. Strategic Management Journal, 29(11), 1141–1154. https://doi.org/https://doi.org/10.1002/smj.703

Damianos, L. S., & Alejandro, S. (2016). Supply chain finance for small and medium sized enterprises: the case of reverse factoring. International Journal of Physical Distribution & Logistics Management, 46(4). https://doi.org/10.1108/IJPDLM-07-2014-0165

Davidson, S., De Filippi, P., & Potts, J. (2016). Economics of Blockchain. SSRN Electronic Journal, 1–23. https://doi.org/10.2139/ssrn.2744751

de la Torre, A., Martínez Pería, M. S., & Schmukler, S. L. (2010). Bank involvement with SMEs: Beyond relationship lending. Journal of Banking and Finance, 34(9), 2280–2293. https://doi.org/10.1016/j.jbankfin.2010.02.014

Dong, Y., & Men, C. (2014). SME Financing in Emerging Markets: Firm Characteristics, Banking Structure and Institutions. Emerging Markets Finance and Trade, 50(1), 120–149. https://doi.org/10.2753/REE1540-496X500107

Du, M., Chen, Q., Xiao, J., Yang, H., & Ma, X. (2020). Supply Chain Finance Innovation Using Blockchain. IEEE Transactions on Engineering Management, PP(4), 1045–1058. https://doi.org/10.1109/TEM.2020.2971858

Erol, S., Jäger, A., Hold, P., Ott, K., & Sihn, W. (2016). Tangible Industry 4.0: a scenario-based approach to learning for the future of production. Procedia CiRp, 54, 13–18.

Euro Banking Association. (2014). European market guide Supply Chain Finance. 2.

Fairchild, A. (2005). Intelligent matching: integrating efficiencies in the financial supply chain. Supply Chain Management: An International Journal.

Folkinshteyn, D., & Lennon, M. (2016). Braving Bitcoin: A technology acceptance model (TAM) analysis. Journal of Information Technology Case and Application Research. https://doi.org/10.1080/15228053.2016.1275242

Fortune Business Insights. (2019). Blockchain in Energy Utilities Market Size, Share and Industry Analysis.

Gao, G.-X. X., Fan, Z.-P. P., Fang, X., & Lim, Y. F. (2018). Optimal Stackelberg strategies for financing a supply chain through online peer-to-peer lending. European Journal of Operational Research, 267(2), 585–597. https://doi.org/https://doi.org/10.1016/j.ejor.2017.12.006

Guo, S., & Liu, N. (2020). Influences of supply chain finance on the mass customization program: risk attitudes and cash flow shortage. International Transactions in Operational Research, 27(5), 2396–2421. https://doi.org/10.1111/itor.12708

Hallberg, K. (2000). A Market-Oriented Strategy for Small and Medium Scale Enterprises. In A Market-Oriented Strategy for Small and Medium Scale Enterprises (Issue April). https://doi.org/10.1596/0-8213-4727-6

Hayes, A. S. (2017). Cryptocurrency value formation: An empirical study leading to a cost of production model for valuing bitcoin. Telematics and Informatics. https://doi.org/10.1016/j.tele.2016.05.005

Hofmann, E. (2005). Supply Chain Finance — some conceptual insights. Logistik Management, 203–214. https://doi.org/10.1007/978-3-322-82165-2_16

Hughes, L., Dwivedi, Y. K., Misra, S. K., Rana, N. P., Raghavan, V., & Akella, V. (2019). Blockchain research, practice and policy: Applications, benefits, limitations, emerging research themes and research agenda. International Journal of Information Management. https://doi.org/10.1016/j.ijinfomgt.2019.02.005

Iansiti, M., & Lakhani, K. R. (2017). The truth about blockchain. In Harvard Business Review.

Jake, F. (2020). Blockchain-as-a-Service (BaaS) Definition.

Jones-Evans, D. (2015). Access to finance to SMEs at a regional level – the case of Finance Wales. Venture Capital, 17(1–2), 27–41. https://doi.org/10.1080/13691066.2015.1052624

Kernahan, A., Bernskov, U., & Beck, R. (2021). Blockchain out of the Box – Where is the Blockchain in Blockchain-as-a-Service? Proceedings of the 54th Hawaii International Conference on System Sciences, 0, 4281–4290.

Kindström, D., & Kowalkowski, C. (2014). Service innovation in product-centric firms: A multidimensional business model perspective. Journal of Business & Industrial Marketing.

Klapper, L. (2006). The role of factoring for financing small and medium enterprises. Journal of Banking &amp; Finance, 30(11), 3111–3130.

Kwaku Amoah, S. (2018). The Role of Small and Medium Enterprises (SMEs) to Employment in Ghana. International Journal of Business and Economics Research, 7(5), 151. https://doi.org/10.11648/j.ijber.20180705.14

Kwaning Mbroh, J. (2015). Financial Management Practices by Small and Micro Enterprise Owners in Ghana - Evidence from the Central Region. International Journal of Economics, Finance and Management Sciences, 3(5), 494. https://doi.org/10.11648/j.ijefm.20150305.21

Lily, J. A. B., & Hartini, A. (2010). Assessing the relationship between firm resources and product innovation performance: A resource-based view. Business Process Management Journal, 16(3), 420–435. https://doi.org/10.1108/14637151011049430

Lu, Q., & Xu, X. (2017a). Adaptable Blockchain- Based Systems. December, 21–27.

Lu, Q., & Xu, X. (2017b). Adaptable Blockchain-Based Systems: A Case Study for Product Traceability. IEEE Software. https://doi.org/10.1109/MS.2017.4121227

Mainelli, M., & Milne, A. (2016). The impact and potential of blockchain on securities transaction lifecycle. SWIFT Institute Working Paper, 2015–007.

Mata, F. J., Fuerst, W. L., & Barney, J. B. (1995). Information Technology and Sustained Competitive Advantage: A Resource-Based Analysis. MIS Q., 19(4), 487–505. https://doi.org/10.2307/249630

Melville, N., Kraemer, K., & Gurbaxani, V. (2004). Review: Information Technology and Organizational Performance: An Integrative Model of It Business Value. MIS Q., 28(2), 283–322.

Mendis, G. J., Wu, Y., Wei, J., Sabounchi, M., & Roche, R. (2020). A Blockchain-Powered Decentralized and Secure Computing Paradigm. IEEE Transactions on Emerging Topics in Computing, 1–14. https://doi.org/10.1109/TETC.2020.2983007

Mendling, J., Weber, I., Van Der Aalst, W., Brocke, J. Vom, Cabanillas, C., Daniel, F., Debois, S., Di Ciccio, C., Dumas, M., Dustdar, S., Gal, A., García-Bañuelos, L., Governatori, G., Hull, R., La Rosa, M., Leopold, H., Leymann, F., Recker, J., Reichert, M., … Zhu, L. (2018). Blockchains for business process management - Challenges and opportunities. ACM Transactions on Management Information Systems, 9(1). https://doi.org/10.1145/3183367

Moodley, S. (2005). The promise of e-development? A critical assessment of the state ICT for poverty reduction discourse in South Africa. Perspectives on Global Development and Technology, 4(1), 1–26.

Morabito, V., & Morabito, V. (2017). Blockchain Value System. In Business Innovation Through Blockchain. https://doi.org/10.1007/978-3-319-48478-5_2

Nam, D. W., Kang, D., & Kim, S. H. (2015). Process of big data analysis adoption: Defining big data as a new IS innovation and examining factors affecting the process. Proceedings of the Annual Hawaii International Conference on System Sciences. https://doi.org/10.1109/HICSS.2015.569

Nelson, R. R., & Sampat, B. N. (2001). Making sense of institutions as a factor shaping economic performance. Journal of Economic Behavior and Organization, 44(1), 31–54. https://doi.org/10.1016/S0167-2681(00)00152-9

Nguyen, Q. K. (2016). Blockchain-A Financial Technology for Future Sustainable Development. Proceedings - 3rd International Conference on Green Technology and Sustainable Development, GTSD 2016, 51–54. https://doi.org/10.1109/GTSD.2016.22

Oppong, M., Owiredu, A., & Churchill, R. Q. (2014). Micro and Small Scale Enterprises Development in Ghana. European Journal of Accounting Auditing and Finance Research, 2(6), 84–97.

Pal, O., Alam, B., Thakur, V., & Singh, S. (2019). Key management for blockchain technology. ICT Express, xxxx, 0–4. https://doi.org/10.1016/j.icte.2019.08.002

Perego, A., & Salgaro, A. (2010). Assessing the benefits of B2B trade cycle integration: a model in the home appliances industry. Benchmarking: An International Journal.

Pilkington, M. (2016). Blockchain technology: Principles and applications. Research Handbooks on Digital Transformations, 225–253. https://doi.org/10.4337/9781784717766.00019

Pratik, R. (2018). How can Blockchain-as-a-Service Fuel a New Phase of Innovation among Global Enterprises?

Prybila, C., Schulte, S., Hochreiner, C., & Weber, I. (2017). Runtime verification for business processes utilizing the Bitcoin blockchain. Future Generation Computer Systems. https://doi.org/10.1016/j.future.2017.08.024

PwC & Supply Chain Finance Community. (2018). SCF Barometer 2018/2019.

Raval, S. (2016). Decentralized Applications. In (1st ed.). Sebastopol, CA: O'Reilly Media. (Vol. 53, Issue 9). Sebastopol, CA: O'Reilly Media. https://doi.org/10.1017/CBO9781107415324.004

Rivard, S., Raymond, L., & Verreault, D. (2006). Resource-based view and competitive strategy: An integrated model of the contribution of information technology to firm performance. The Journal of Strategic Information Systems, 15(1), 29–50. https://doi.org/https://doi.org/10.1016/j.jsis.2005.06.003

S., R. W., & M., T. F. (2009). Supply chain financing: using cash-to-cash variables to strengthen the supply chain. International Journal of Physical Distribution & Logistics Management, 39(8), 669–689. https://doi.org/10.1108/09600030910996314

Sam, D. (2021). Top Blockchain Applications to Know for 2021 | Built In.

Samaniego, M., Jamsrandorj, U., & Deters, R. (2016). Blockchain as a Service for IoT. 2016 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), 433–436. https://doi.org/10.1109/iThings-GreenCom-CPSCom-SmartData.2016.102

Sarmah, S. P., Acharya, D., & Goyal, S. K. (2007). Coordination and profit sharing between a manufacturer and a buyer with target profit under credit option. European Journal of Operational Research, 182(3), 1469–1478. https://doi.org/10.1016/j.ejor.2006.09.047

Shi, J. (2019). The Application of Blockchain-as-a-Service (BaaS) and its providers in China. Advances in Economics, Business and Management Research, 106(Febm), 127–130. https://doi.org/10.2991/febm-19.2019.28

Shin, D. H. (2016). Demystifying big data: Anatomy of big data developmental process. Telecommunications Policy. https://doi.org/10.1016/j.telpol.2015.03.007

Treat, D., Brodersen, C., Blain, C., & Kurbanov, R. (2017). Banking on Blockchain - A Value Analysis for Investment Banks. Accenture Consultung, 10.

van der Vliet, K., Reindorp, M. J., & Fransoo, J. C. (2015). The price of reverse factoring: Financing rates vs. payment delays. European Journal of Operational Research, 242(3), 842–853. https://doi.org/https://doi.org/10.1016/j.ejor.2014.10.052

Verma, S. (2017). THE ADOPTION OF BIG DATA SERVICES BY MANUFACTURING FIRMS: AN EMPIRICAL INVESTIGATION IN INDIA. Journal of Information Systems and Technology Management. https://doi.org/10.4301/s1807-17752017000100003

Wang, F., Yang, X., Zhuo, X., & Xiong, M. (2019). Joint logistics and financial services by a 3PL firm: Effects of risk preference and demand volatility. Transportation Research Part E: Logistics and Transportation Review, 130, 312–328. https://doi.org/https://doi.org/10.1016/j.tre.2019.09.006

Wang, X., Guo, H., Yan, R., & Wang, X. (2018). Achieving optimal performance of supply chain under cost information asymmetry. Applied Mathematical Modelling, 53, 523–539. https://doi.org/10.1016/j.apm.2017.09.002

Wang, Y., Singgih, M., Wang, J., & Rit, M. (2019). Making sense of blockchain technology: How will it transform supply chains? International Journal of Production Economics, 211(November 2018), 221–236. https://doi.org/10.1016/j.ijpe.2019.02.002

Yang, C.-S., & Lirn, T.-C. (2017). Revisiting the resource-based view on logistics performance in the shipping industry. International Journal of Physical Distribution & Logistics Management.

Zachariadis, M., Hileman, G., & Scott, S. V. (2019). Governance and control in distributed ledgers: Understanding the challenges facing blockchain technology in financial services. Information and Organization, 29(2), 105–117. https://doi.org/10.1016/j.infoandorg.2019.03.001

Zamani, E. D., & Giaglis, G. M. (2018). With a little help from the miners: distributed ledger technology and market disintermediation. Industrial Management and Data Systems. https://doi.org/10.1108/IMDS-05-2017-0231

Zhu, Y., Zhou, L., Xie, C., Wang, G. J., & Nguyen, T. V. (2019). Forecasting SMEs' credit risk in supply chain finance with an enhanced hybrid ensemble machine learning approach. International Journal of Production Economics, 211(January), 22–33. https://doi.org/10.1016/j.ijpe.2019.01.032

**Declaration of Interest Statement:**

Authors of this paper declare that we have no any competing financial, professional, or per¬sonal interests from other parties.